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CONTENTS

- Factors in the Organizational Development of Task-Oriented Groups
Harold Guetzkow and William R. Dill 175
- A Procedure for Clique Detection Using the Group Matrix
Frank Harary and Ian C. Ross 205
- Issues in the Concept of Need-Complementarity *Irving Rosow* 216
- Multidimensional Ratings of Occupations
Peter H. Rossi and Alex Inkeles 234

SOCIOMETRY

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Sociometry is concerned with the entire range of interests and problems represented by research in social psychology. It is the policy of the editors to seek those manuscripts for publication which represent the significant research interests of investigators who are concerned with giving the field of social psychology theoretical structure and reporting research which is clearly focused, well designed, and competently conducted.

While social psychology is presently regarded by most as a field with indeterminate boundaries, it has as its central focus the investigation of the processes and products of social interaction at the interpersonal, intrapersonal, intergroup and intragroup levels and the development of significant generalizations therefrom. In keeping with the more general meaning of the name of the journal emphasis will be placed on measurement of social behavior. However, this emphasis does not exclude the acceptability of good articles which must rely upon qualitative materials and analyses.

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Factors in the Organizational Development of Task-Oriented Groups¹

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In a re-examination of the work of Bavelas, Leavitt, and Smith on task-oriented groups, the effects of communication restriction on task performance were found to be quite different from their effects upon organization for task performance. Our analysis indicated that the main impact of the communication restriction was not on the eventual efficiency of the group. The central impact, instead, was on the ability of the group to organize itself for effective performance, given demands of the operating task.

This paper analyzes the way in which communication restrictions affected the differentiation of organizational patterns in the Bavelas communication situation.

Considerable work has been done with the Bavelas situation since its formulation in 1950 (1). Leavitt (8) pioneered with experimental applications. As an investigatory tool, the situation has permitted tests of the effects of many variables, from channel noise (6) to leadership style (12). Bavelas, Shaw, and their associates have focused their work on the effects of communication restrictions on task performance and morale. Yet in pursuing these interests, they have confronted the organizational problem, as their development of such concepts as *centrality*, *independence*, and *saturation* indicate. Only gradually, as in the excellent work of Trow (14), is the web of interrelations among such organizational characteristics as centrality, autonomy, and status becoming clear.

Our interest has centered on understanding how communication restrictions affect the ability of task-oriented groups to establish organizational structures for successful task performance.

We have moved in quite an opposite direction from a group at Massachusetts Institute of Technology, who concurrently have explored modi-

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fications of the basic Bavelas situation. Christie, Luce, and Macy (3) reduced to a minimum the opportunity that participants have to develop an organizational structure, beyond that which evolves from performing the immediate task. We modified the situation so that there would be ample opportunity for planning an organization to handle the task problem optimally (5). The MIT variation restricted learning of one's organizational role to knowledge obtained about local, proximate conditions within the organization. Our variation enhanced the opportunities for communication about the nature of the organization and allowed special time for planning the organization's development.

The research reported in this paper analyzes the processes involved in the organizational development which was merely described in our first paper (5). It explores two theories of organizational behavior—local learning and insightful planning—in the data of our original experiment, with comparisons to the MIT findings. Then it reports a test of these conclusions in a second experiment, carried out after the *post hoc* theory construction. Further analysis of data from the second experiment reveals that when the task of organizing is difficult, the loss (due to communication restrictions) of opportunities to interchange personnel seriously interferes with optimal development of the organization.

DESCRIPTION OF THE EXPERIMENT

Our initial experiment, in part, replicated the work of Leavitt (8) and has been described in detail elsewhere (5, 15). Here we give only a brief description. Variations introduced into our second experiment, to test findings from the first, will be described later, following the analysis of organizational development in the initial experimental groups.

The initial experiment involved 56 groups of 5 men each who operated in the situation designed by Leavitt, modified to permit study of the group's handling of its operating task separately from its handling of its organizational problem. The task was the same that Leavitt used. Each of the five subjects had one piece of a standard set of six pieces of information. The task was to determine which piece was missing on a given trial. Then each man was to identify the piece to the experimenter.

Two hundred and eighty male freshman engineering students served as subjects for the experiment. The groups were equated with respect both to the average and to the spread of intellectual ability among their five members (ACE Psychological Examination scores were used.). Every group included one man from each quintile of the local freshman population.

Each group operated in the laboratory for about 2 hours. In this time, the operating task was repeated twenty times. The time used for task completion varied from 6 minutes to less than a minute per trial. The

subjects were seated around a circular table, screened from each other's view by five radial partitions. After the subjects had been given preliminary instructions on the operating task, no oral communication among them was allowed. During the task trial, the subjects exchanged messages through slots in their partitions. Messages were written on precoded cards. When all five men had signaled knowledge of the missing information to the experimenter, a bell sounded automatically to end the trial.

To provide the group an opportunity to work on its organizational problems, 2 minutes were allowed between trials. During the intertrial periods, the subjects exchanged messages written on blank cards. By a signaling arrangement, the subjects were able to terminate the intertrial periods at any time they wished before the end of the allowed 2 minutes.

Did this modification of the Leavitt design—the insertion of an intertrial period—actually allow sufficient opportunity for organizational planning? Did the subjects want more time? Subjects who felt ready to go on to the next task trial before the 2-minute intertrial period ended could signal their desire to the experimenter. If, for each group, we add the number of "persons ready to go" over the 19 intertrial periods, the maximum possible score is 95. Totals from the experiment gave averages of 67.8, 84.0, and 75.8 "persons ready to go" for the All-channel, Wheel, and Circle groups respectively. None of these figures is significantly different from the others.

The distribution of subjects' intentions over the 19 intertrial periods is shown for the three types of groups in Figure 1. Even at the beginning of the experiment, some members in the group (on the average) wanted to curtail the intertrial period; and toward the end of the experiment, almost all subjects were ready to proceed to the next task trial before the allowed 2 minutes had elapsed. Thus, the maximum of 2 minutes for each intertrial period apparently gave the subjects ample opportunity for organizational activity.

For the members of all groups there was a correlation of -0.56 between the number of intertrial messages a subject sent and the numbers of times he was "ready to go" before the experimenter ended the intertrial period. Individuals who sent fewer intertrial messages were ready sooner to go on to the next trial.

Since pre-experimental instructions and practice reduced the operating task to a routine, groups could concentrate in the intertrial periods on organization. Three types of communication nets were imposed in the first experiment (See Figure 2). Twenty of the groups operated without restriction, *all channels* being open for communication ("All-channel" groups). Fifteen groups operated with severe restrictions in a *wheel* arrangement in which the four "spokes" could communicate only with the "hub"

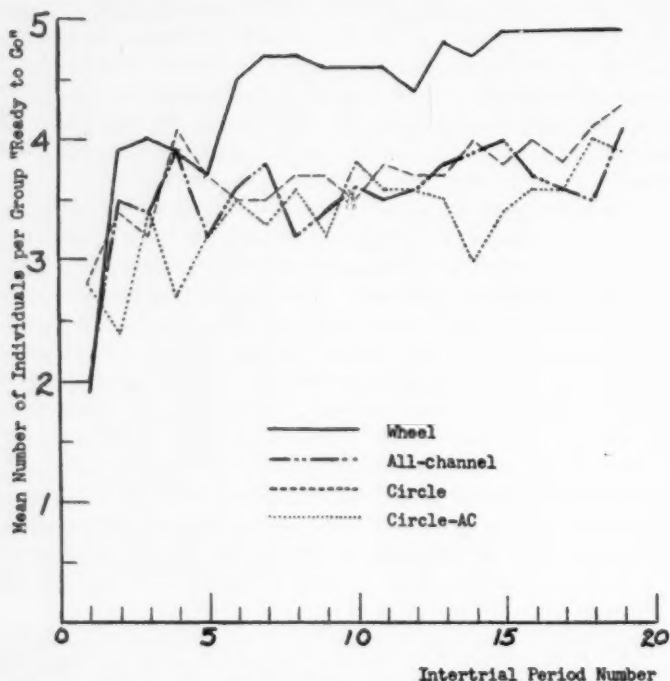


FIG. 1. Average number of individuals ready to begin next trial before end of regular intertrial period

("Wheel" groups). Twenty-one of the groups operated in a *circle* net in which members could communicate only with the two men immediately to their left and right ("Circle" groups).

Among groups in the different nets, there were large differences over the twenty trials in how they organized themselves for performance of their operating task. All Wheel groups organized after three to four trials into "two-level hierarchies," as illustrated in Figure 3. In these groups, each of the four end men sent his information (messages about pieces in the standard set that he possessed) to the key man. The key man formed the solution and then sent the answer (telling which piece was missing) to the four participants.

Similarly, by the end of the twentieth trial, 17 of the All-channel groups had developed a two-level hierarchy for their initial information exchange; but only 11 of the 17 used the same hierarchy for returning the answers. Six of the 17 groups used a three-level hierarchy for sending answers; as

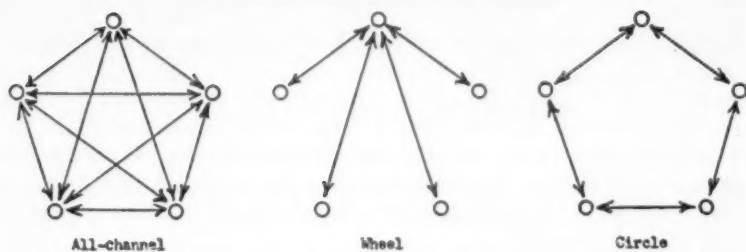


FIG. 2. Open channels used in the three nets

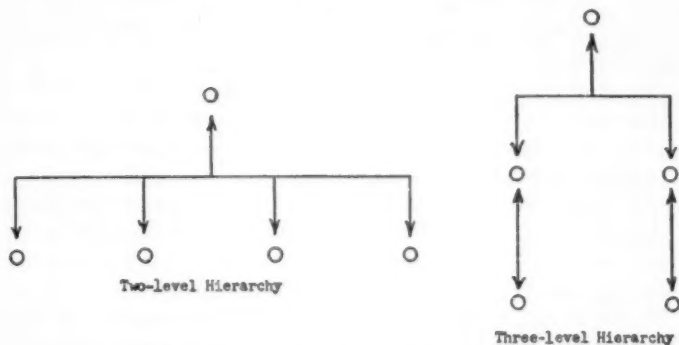


FIG. 3. Patterns of hierarchical organization

Figure 3 shows, the key man returned answers to two men, who in turn relayed the answers to the other two (at the ends of the hierarchy). Ten of the 21 Circle groups had developed three-level hierarchies for sending answers by the end of the twentieth trial, but only three of these ten groups used the three-level arrangement to gather information.

Those Circle and All-channel groups which did not organize themselves into hierarchies tended to remain "primitive" and undifferentiated, each person broadcasting his information and eventually the answer to all of the others in the group to whom he could send messages. These groups took more time than the organized groups to perform the task.

Among the groups that used two- or three-level hierarchies both for information and for answer exchange, there were no significant differences in task-solution times at the end of the 20 trials, regardless of the communication net within which they functioned. Nor did the average of their three fastest task-trial times differ significantly from the time predicted for task performance on the basis of a time-and-motion study analysis (5, pp. 248-249).

If it was possible for all groups to achieve the same level of efficiency,

why did groups operating under different communication restrictions demonstrate great differences in ability to organize optimally for task performance? As we mentioned above, there are at least two ways in which members may have acquired their patterns of organizational behavior—by local learning of roles, and by cooperative, insightful planning of the organization structure. To what extent were these two methods involved in the development of hierarchical structures in the 56 task-oriented groups of the initial experiment?

DESCRIPTION OF THE ORGANIZATIONAL PROBLEMS

The three different communication nets posed quite different organizational problems for the experimental groups:

1. *The All-channel net*: Each person in this net was able to write to all four others in his group. No relaying of messages through a second party was required. Yet the lack of restrictions on communication provided almost too many opportunities—a total of 20 one-way channels. Each All-channel group had the difficult job of developing its own restrictions. The job was complicated by the fact that each man had equal potential for leadership with respect to his place in the communication net.
2. *The Wheel net*: In this net, if the “hub” man became the solution-former, the group required a minimum of effort to organize for handling the operating task. Each end man sent his information to the “hub” man, who formed the solution and then sent answers back. There was no need to relay messages through a second party. Since all “unnecessary” channels were blocked, their elimination was not part of the organizational problem. The existence of the “hub” man meant that the positions in the net were not equipotential.
3. *The Circle net*: This net had symmetry of positions, like the All-channel net; but there were many fewer communication opportunities. It was imperative to use a relay system to perform the task. No potential solution-former had immediate access to the other four pieces of information, and none could send the answer directly to the other four participants.

LOCAL LEARNING OF ORGANIZATIONAL DEVELOPMENT

The development of response patterns from undifferentiated, random-like exchanges of information and answers into differentiated, hierarchical behavior is typical of many individual and group learning situations. Unnecessary responses are eliminated as a group progresses from trial to trial. Necessary responses are reinforced. As necessary responses come to dominate individuals' behavior, an organizational structure develops.

For our experiment, some consequences of local learning in the solution of the organizational problem will be predicted; and then, data of the original experiment will be used to check the prediction.

Predictions of Local Learning Theory

1. *Learning of answer exchanges:* In our experiment, a subject who has formed a solution is able to send it to others. The answer message will be received gladly, for then the receiver can indicate he has it by throwing his switch. The receiver may also relay the answer to others if his net allows and if the bell has not rung to end the trial. Because a message which gives the answer is prized, its origin will probably be remembered. Thus we predict that only rarely will an answer be re-sent to the person from whom it has been received. The receiver is likely, however, to relay the answer to others. If he throws his switch first, he has no fear of delaying the group's solution time by sending relay messages. His tendency to relay the answer is reinforced by his expectation that relaying may help improve the group's performance. We would expect the tendency to persist; it would be extinguished only by resistance to effort involved or by termination of the trial before the answer could be relayed.

2. *Learning of information exchanges:* Consider now the nature of the problem involved in organizing the information exchanges. If the subject has but one channel open, there is little to learn. He first sends his information through the channel and then soon realizes, as in the answer exchange situation, that returning whatever information he receives is unnecessary. If the subject has more than one channel open, he has a much more difficult task; for he must decide to whom he should send his own information and to whom he must relay information that he receives from others. What determines to whom information messages will be sent? In terms of local learning theory, we may predict that subjects will tend to direct information to those persons from whom the answer (a reward) is received.

From trial to trial, then, we would expect reduction to occur in the numbers of information messages exchanged, while numbers of answer messages exchanged should remain relatively constant.

Empirical Tests of Local Learning Theory

These hypotheses may be checked by separating the answer messages from the information messages sent during the task trials by groups in the three nets. This has been done in Figure 4. The prediction that the reduction in messages is accountable almost entirely in terms of the information exchanges was verified in the Wheel and in the Circle groups. For the All-channel groups, contrary to prediction, there was a significant reduction from earlier to later trials in the number of answer messages sent.

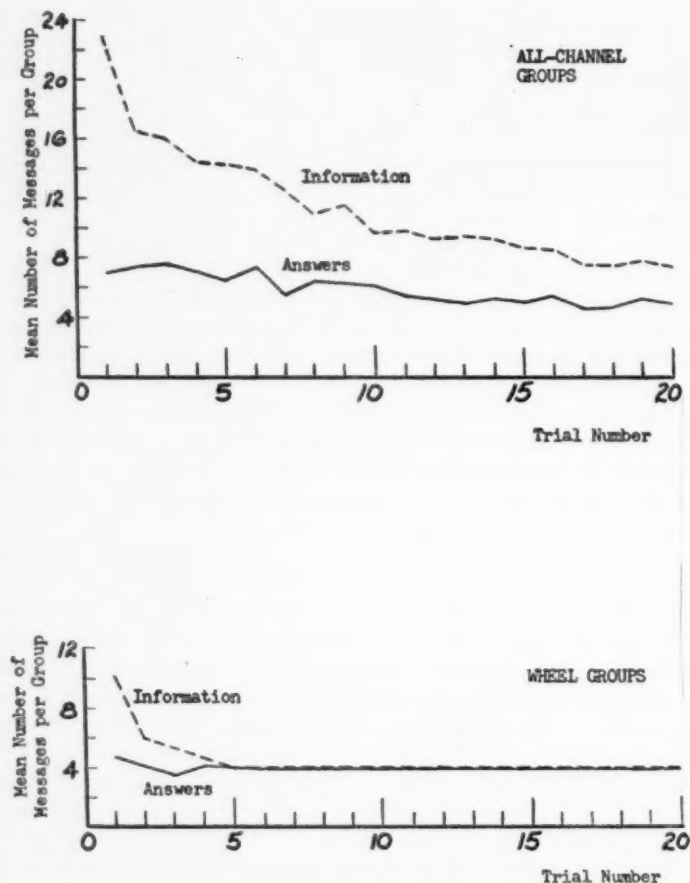


FIG. 4. Comparison of reduction in information and answer messages

During the first ten trials, All-channel groups exchanged more answer messages than Circle groups. During the last ten trials, the volume of messages for both All-channel and Circle groups hovered about a level of five messages per trial. In the early stages, the difference may have arisen from the fact that All-channel subjects had three times as many channels as Circle subjects from which they had not received an answer. As the experiment progressed and the organization differentiated, the trial times got shorter, reducing the extra time available to All-channel subjects for relaying answers.

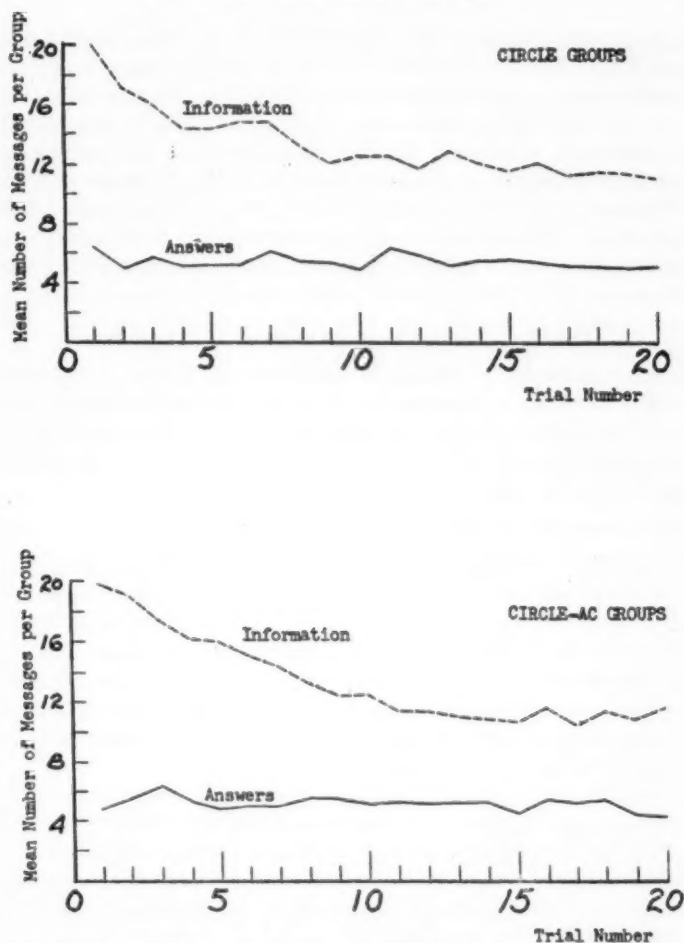


FIG. 4. (continued). Comparison of reduction in information and answer messages

An attempt was made to verify the prediction that the sending of information would depend on reinforcement by the reward of receiving answers. An analysis was made on those Circle and All-channel groups which eventually achieved somewhat differentiated organizations. The number of information messages received by those persons who had sent or had not sent answers during the previous trial was checked. Using only those trials *before* a final organization was reached, we found in the All-channel groups that an average of 2.72 information messages were received by those who

had supplied an answer in the previous trial, compared with 1.94 information messages by those who had not sent an answer. In the Circle groups, the corresponding figures were 2.49 and 2.30. The difference between the amount of information received by persons who had sent or who had not sent answers is significant² only for members of the All-channel groups. These findings indicate a partial verification of the reinforcement hypothesis. The failure of the hypothesis for Circle groups, even though only those groups which differentiated on the answer exchange were used, suggests that additional factors played a part in the development of the organizations.

PLANNING THEORY OF ORGANIZATIONAL DEVELOPMENT

The investigation to this point indicates that a local reinforcement learning mechanism is not adequate to explain the organization of message exchange structures. Perhaps an analysis of activity during the intertrial "free-message" periods will be helpful in understanding how the net restrictions affected the ability of our groups to organize.

General Description of Intertrial Activity

The attempt to limit messages within the trial period to messages about the operating task was successful. Only rarely did a subject write a nontask message on the bottom of a task card sent during a trial. During the intertrial periods, the 56 groups sent about 5,500 "free" messages. These were coded into 18 categories³, which may be subsumed into four groupings:

1. *Organizational messages* in which subjects discussed the imposed communication net or ways in which they might arrange the interchange of their task messages.
2. *Operating task messages* about such mechanical features of operating performance as pushing message cards through slots, working light switches, and improving the precoding of task message cards.
3. *Motivational messages* by which subjects encouraged one another to sustain or to improve task performance, with comments like "Good job" or "That was too slow."
4. *Social messages* quite unrelated to the task or organizational problem, in which subjects expressed general reactions toward the experiment or discussed irrelevant matters (Examples: "Can we smoke?" or "How about that secretary in the office outside?").

² All differences reported in this paper as "significant" or as "statistically significant" would have occurred by chance with a probability of less than .05, as estimated by the *t*-test (unless another test is explicitly mentioned).

³ The methods used in this and in subsequent coding of qualitative answers are given in detail in a specially prepared microfilm (15). Generally, they follow the concepts formulated in Guetzkow (4).

Table 1 shows how the relative frequencies of organizational, task, motivational, and social messages differed within and between types of groups. Because of the large number of units involved, almost all the differences are statistically significant.

The bulk of the message units (about 45 per cent of the total) were devoted to activity in the organizational area. Some 16 per cent of the message units were devoted to the mechanics and routines for physically handling the operating task activities. Note that the three types of groups devoted proportionally about the same amount of effort to this activity. Some 28 per cent of the message units were devoted to the motivational problems of the groups, with large variations among the different types of groups. The All-channel groups devoted more message units to goading each other than either the Wheel or the Circle groups. Social messages were infrequent in all patterns—forming only 9 per cent of the total.

We shall focus here on analysis of the organizing messages, to see whether a planning mechanism underlay the development of organizational structures and to describe its characteristics. The organizing messages may be grouped into two kinds: (a) those concerned with perception of the structure that was imposed or that was evolving, and (b) those devoted to plans for a more efficient organization. The detailed breakdown of the codification is given in Table 2.

TABLE 1
Distribution of Intertrial Message Units
(Average Number of Units per Group over 19 Intertrial Periods)

Message unit category	All-channel net		Wheel net		Circle net		Circle-AC net*	
	Average no. of units per group	% of total in net	Average no. of units per group	% of total in net	Average no. of units per group	% of total in net	Average no. of units per group	% of total in net
Motivational	36.3	28	11.5	23	32.0	32	43.7	32
Organizational	59.6	46	24.5	49	41.9	41	48.3	35
Operating task activity	18.8	15	10.3	20	16.9	17	27.0	20
Social	11.9	9	3.5	7	9.1	9	16.9	12
Unclassified	2.1	2	.5	1	1.6	1	1.0	1
Totals	128.7	100	50.3	100	101.5	100	136.9	100
Averaged no. of units per intertrial period	6.8	—	2.6	—	5.3	—	7.2	—

* The Circle-AC groups were part of a second experiment, to be described later in this paper. To save repetition, data for these groups have been included in the tables and figures which follow. They should be disregarded until reported in the text.

TABLE 2
Distribution of Intertrial Message Units
 (Average Number of Units per Group over 19 Intertrial Periods)

Organizational message unit category	All-channel net		Wheel net		Circle net		Circle-AC net	
	Average no. of units per group	% of total in net	Average no. of units per group	% of total in net	Average no. of units per group	% of total in net	Average no. of units per group	% of total in net
<i>Perception of structure</i>	20.6	35	21.3	86	29.4	70	29.3	61
<i>Understanding-of-net</i>	7.2	12	20.9	85	13.0	31	7.2	15
<i>Inquiries about, eval- uations of proposed plan.....</i>	13.4	23	0.4	2	16.4	39	22.1	46
<i>Organization planning</i>	39.0	65	3.2	14	12.5	30	19.0	39
<i>General proposals..</i>	10.8	18	0.4	2	4.9	12	8.2	17
<i>Specific proposals...</i>	18.6	31	2.8	11	4.4	10	8.0	17
<i>Promulgation of pro- posals.....</i>	9.6	16	0.0	0	3.2	8	2.8	6

Perception of Structure

Members of the All-channel, Wheel, and Circle groups respectively devoted 35, 86, and 70 per cent of their organizational messages to perception of their structures. In perceiving structure, the subjects (a) tried to understand the communication net in which they were operating and (b) made inquiries about and evaluations of proposals for the development of their organizations. But, as the upper part of Table 2 shows, there were dramatic differences among the three nets in the ways in which members devoted themselves to the task of perceiving their environment.

Comments like "To whom can you send"? or "I get messages from four people" were classified as *understanding-of-net* messages. To the problem of understanding the imposed communication restrictions, All-channel groups devoted about 12 per cent of their organizational messages; Circle groups, some 31 per cent. The Wheel groups devoted almost all of their intertrial organizational effort (some 85 per cent) to perceiving the nature of the imposed net. Because of the large numbers of messages involved, the differences among these percentages are statistically significant.

Members of the All-channel and of the Circle groups also made considerable effort to understand and to evaluate their organizations as they developed during the experiment. Subjects made *inquiries* of one another during the intertrial period: "Why am I the last man to get the answer?" "Am I supposed to send my symbol to G?" and so on. They also made *evaluations* of their organizational procedures, such as "The plan's OK" and "S is doing a good job as key man." These messages about the evolving

organization constituted an additional 23 per cent of the organizational messages for the All-channel groups and 39 per cent for the Circle groups. The Wheel groups devoted very little effort to such intertrial activity—their organizations developed immediately because of the severe communication restrictions; and after development, there was not much to inquire about.

Groups in the All-channel nets tended to achieve satisfactory organizations. But groups in the Circle nets, despite a third again as many messages devoted to perception of structure, generally failed to organize efficiently. Does this mean that although some explicit understanding of the net and of the evolution of the organization is necessary, understanding *per se* is not sufficient to induce the development of continuing, differentiated organizations?

Such appears to have been the case for our groups. When a comparison is made of the average number of messages about structural perceptions sent during intertrial periods *before* the group had stabilized its organization, we find no significant differences between the groups which eventually organized and the groups which failed to organize (see Table 3).

Planning Activities

What, then, was responsible for the development of organizational patterns in the All-channel and Circle groups? Sixty-five and 35 per cent, re-

TABLE 3
*Intertrial Messages about Perception of Structure**
(Average Number of Message Units per Group per Intertrial Period)

Net and groups	Before organization	After organization
<i>All-channel groups</i>		
Organized ($n = 13$)	1.29	.81
Unorganized† ($n = 6$)	.77	1.12
<i>Circle groups</i>		
Organized ($n = 5$)	1.52	1.33
Unorganized† ($n = 15$)	1.96	.82
<i>Circle-AC groups</i>		
Organized ($n = 8$)	2.09	1.21
Unorganized† ($n = 11$)	1.93	.57

* Within the table, *t*-tests show that the differences between means, *before* and *after* organization, are statistically significant for only two types of groups: *unorganized Circle* and *unorganized Circle-AC*. Of the differences within nets between *organized* and *unorganized* groups *before* organization, none proved significant.

† The unorganized groups, of course, never stabilized into differentiated patterns. For these groups, the "before" data in Tables 3 and 4 are taken from the first eight intertrial periods, the "after" data from the last seven. Trials 8-11 constituted the modal point at which organized groups stabilized into their differentiated patterns.

spectively, of the organizational messages in the two groups were *not* concerned with perception of organizational structure, but instead were concerned with planning more efficient structures. In these planning messages, can we find an explanation of the way in which the groups succeeded in organizing themselves?

In coding the organizational messages that dealt with planning, we established three categories:

1. Specific proposals for organization, suggesting the proposer himself or others for particular tasks. (For example, a proposer might suggest the plan: "I will solve the problem and then send out answers." Or one group member (say G) might propose to K: "Send your information to S.")
2. Plans that were more general in nature (Examples: "Why don't we send all our messages to one person?"; "Send all messages clockwise.").
3. Messages that merely promulgated a suggestion initiated by someone else. (For example, suppose P suggested to G that G should "send to S first." Then a follow-up message by G to M, "Let's keep it going to S," is a promulgation of the plan.)

The average number of messages in these three categories, for different kind of groups, is presented in the lower part of Table 2. The differences between the groups in planning activity are all significant and seem to center in the extent to which plans were suggested and promulgated. The Wheel groups, compared with the All-channel groups, needed little active planning because their organizational development was dictated by the communication net. But the Circle groups, which so urgently needed planning, had less than half the number of planning messages used by the All-channel groups. These data are commensurate with the general finding that the Circle groups did not develop differentiated organizational structures nearly so frequently as the All-channel groups.

It is useful to explore these differences in planning activity further by contrasting the organized and the unorganized groups within each type of net (omitting the Wheel net, which had no unorganized groups). Were the three kinds of planning messages actually responsible for the organization of the groups? An analysis similar to the one made for messages about perception of structure (Table 3) is presented in Table 4.

Note that the organized groups in both nets (All-channel and Circle) differed significantly in terms of their specific proposals from the groups which failed to organize. Yet a significant difference occurs only for Circle groups with regard to their general proposals or plans. The significant decrease from the number of general proposals made in early trials to the number made in later trials holds for both organized and unorganized groups; hence, we discount the number of general proposals made as a significant fact by which to distinguish organized from unorganized groups.

TABLE 4

Intertrial Messages about Organizational Plans

(Average Number of Message Units per Group per Intertrial Period)

Net and message category		Before organization	After organization
<i>All-channel Groups*</i>			
General proposals	{ Organized	.71	.43
	{ Unorganized†	.94	.26‡
Specific proposals	{ Organized	2.25	.13‡
	{ Unorganized†	.67§	1.90
Promulgations of proposals	{ Organized	.73	.16‡
	{ Unorganized†	.32	.19
Specific proposals + Promulgations of proposals	{ Organized	2.98	.29‡
	{ Unorganized†	.99§	2.10
<i>Circle groups*</i>			
General proposals	{ Organized	.73	.18‡
	{ Unorganized†	.30§	.07‡
Specific proposals	{ Organized	.58	.08
	{ Unorganized†	.18§	.08
Promulgations of proposals	{ Organized	.38	.25
	{ Unorganized†	.14	.06
Specific proposals + Promulgations of proposals	{ Organized	.97	.34
	{ Unorganized†	.31§	.13
<i>Circle-AC groups*</i>			
General proposals	{ Organized	.56	.16‡
	{ Unorganized†	.67	.20
Specific proposals	{ Organized	.97	.11‡
	{ Unorganized†	.41§	.25
Promulgations of proposals	{ Organized	.47	.05‡
	{ Unorganized†	.19	.05
Specific proposals + Promulgations of proposals	{ Organized	1.44	.16‡
	{ Unorganized†	.60§	.30

* For each net, the numbers of organized and unorganized groups are the same as reported in Table 3.

† See footnote to Table 3.

‡ For the given groups and type of message, the difference between the mean number of message units per group per intertrial period *before* vs. *after* organization is statistically significant.

§ For the given net and type of message, the difference in mean numbers of message units sent per group per intertrial period *before* organization in *organized* vs. *unorganized* groups is statistically significant.

At the beginning of this report, we speculated that the tasks for the groups in the All-channel and in the Circle nets were fundamentally distinguished by the paradoxical requirement in the Circle net that groups must organize to relay intertrial messages before they could relay their

organizational plans. The Circle groups had no such organization for relaying, while subjects in the All-channel groups had no need to relay organizational messages.

If successful relaying of proposals requires organization, then we would expect for the Circle groups (vs. the All-channel groups) a lower volume of specific organizational proposals and promulgations. The data in Table 4 do not contradict this expectation. For the two types of organizational messages, the average number per intertrial period per group was 0.33 ($\sigma = 0.31$) for the Circle groups and 1.45 ($\sigma = 1.27$) for the All-channel groups. The three-fold difference is statistically significant.

The Circle groups neither sent many specific proposals for organization nor promulgated the few they did send, apparently because the communication net interfered with successful handling of the organizational task.

AN EXPERIMENTAL TEST OF THE PLANNING HYPOTHESIS

If the *post hoc* interpretation of the initial experiment is correct, we might assert *a priori* that groups which are allowed to use all channels for their intertrial, organizing activity (whatever their task trial net) should succeed as well in organizing for task performance as groups which can use all channels both for organizing and for task performance. Is the opportunity to communicate freely about organizational plans the key to success in organizing?

To test this possibility, we ran an additional variation of the experiment involving 20 five-man groups. The experimental procedures were identical to those of the original experiment (*supra*, p. 176), except that in the variation, communication nets were alternated from task-trial to intertrial period. During the *task trials*, the net arrangement was the same that was used throughout both task and intertrial periods in the Circle groups of the original experiment. During the *intertrial* periods, the communication restrictions were removed by opening all barred channels, making the pattern identical to one used throughout both task and intertrial periods by the All-channel groups. Hence, these new groups are designated as "Circle-AC."

The subjects themselves removed the mechanical barriers to communication at the end of each task trial and replaced them at the end of the intertrial period. Checks were made constantly by the experimenter to guarantee conformity.

The arrangement in the new experiment⁴ allows an empirical test of the

⁴ Because this second experiment was performed two years after the original experiment, eleven control groups (five All-channel and six Circle) were run simultaneously with the 20 Circle-AC groups. The second experiment seems to have provided a situation essentially identical to the first. Data from the eleven control groups were combined with data from the first experiment and have been reported above as well as in (5).

TABLE 5
Time of Task Trials
 (Minutes)

Net	Total time		Average of the three fastest trials	
	Mean	Standard deviation	Mean	Standard deviation
Circle-AC ($n = 20$).....	28.14	5.08	0.70	0.21
All-channel* ($n = 20$).....	24.38	4.82	0.54	0.15
Wheel* ($n = 15$).....	19.12	3.09	0.46	0.08
Circle* ($n = 21$).....	29.45	5.08	0.73	0.15

* These data for the All-channel, Wheel, and Circle groups are taken from Table 2 in the article (5, p. 242) reporting the initial experiment.

prediction that task performance in a restricted net will be equal to that in an unrestricted net, if the restrictions are removed during the intertrial period so that a relay system may be organized.

Task trial times may be used as one criterion of success in organization. The average total times used by groups for 20 repetitions of the task and the average of the times required on the three fastest trials in each group are presented in Table 5.

Comparison of the results for Circle-AC groups with the results of the initial experiment fails to support the prediction that the removal of restrictions on intertrial communication would facilitate organization. The Circle-AC groups, with complete freedom of communication during the intertrial periods, seem not to have done any better in the aggregate with respect to task performance times than did the Circle groups of the initial experiment. The differences between the All-channel groups and the Circle-AC groups are statistically significant both for the total times and for the averages of the three fastest trials.

The results taken in the aggregate, however, may be deceptive. When averages of the times on the three fastest trials for the 20 Circle-AC groups are arranged in an ascending series, we note a discontinuity in the distribution: .41, .42, .42, .42, .43, .47, and .49 minutes; then .71, .73, .75, .78, .78, .81, .82, .83, .83, .87, .89, .92, and 1.13 minutes. An independent Methods-Time-Measurement estimate of operating time was .44 minutes per trial for an organized two or three-level hierarchy.⁵ Perhaps the prediction was successful for 7 groups, but failed in the case of the remaining 13. What prevented the Circle-AC groups from achieving the levels of performance that MTM analysis showed was possible?

⁵ The MTM estimates were made by Mr. Kurt Hellfach and are described in detail in a previous article (5, pp. 237-238).

POST HOC ANALYSIS OF THE SECOND EXPERIMENT

Perhaps clues can be obtained from a *post hoc* analysis of the second experiment. First, the organizational stability and arrangement of Circle-AC groups will be examined. Then a check will be made of intertrial messages to see how the organizing activity of the Circle-AC groups differed from that of the Circle and All-channel groups.

Organizational Stability

The same methods which were used to analyze the stability of interaction patterns in the first experiment (5, pp. 243-244) were applied to the analysis of task trial messages for the second experiment. For each group, the degree of stability in five segments of the experiment (each segment consisting of four successive task trials) was measured both for the information and for the answer exchanges. In the Circle-AC groups, some 58 per cent of the total number of four-trial segments evidenced quite stable interaction patterns, with respect to the regularity with which open channels were used for exchanging information and answers. Sixteen per cent of the segments were semistable, and 26 per cent were unstable. These figures for the Circle-AC groups do not differ significantly from the 51 per cent stable, 23 per cent semistable, and 26 per cent unstable segments obtained in the initial experiment for the Circle groups.⁶ Thus the greater freedom of intertrial communication that Circle-AC groups enjoyed did not evidence itself in the stability levels of task-trial interaction.

Organizational Arrangement

When the stable and semistable interaction systems used by the Circle-AC groups in task trials are examined in detail, we find that they lie midway between the All-channel and the Circle groups with respect to the extent of differentiation in organizational structure. This analysis, as before, was done separately for the information and for the answer exchanges.

Exactly half of the Circle-AC groups developed a three-level hierarchy pattern for sending *information* messages during the task trials. This contrasts with the 14 per cent who developed a three-level hierarchy in the Circle groups and with the 85 per cent who developed a two or three-level hierarchy in the All-channel groups. All these differences are statistically significant. Of the Circle-AC groups which do not develop hierarchies, one developed a semistable "round robin" pattern for exchanging information; the other nine groups used an "each-to-all" exchange.

In the *answer* exchanges, there were more Circle-AC groups (60 per cent) that tended to use hierarchies than there were Circle groups (48 per cent);

⁶ Results for the Circle groups, as well as for the All-channel and Wheel groups, are reported in (5), Table 3, p. 245.

but there were fewer Circle-AC groups than there were All-channel groups (85 per cent). These differences are not significant (except for the Circle vs. the All-channel groups). The one Circle-AC group which used a semi-stable "round robin" pattern for its information exchange also adopted a "round robin" pattern for its answer exchange. The remaining seven Circle-AC groups used "each-to-all" patterns for their answer exchanges.

Considering the degree of differentiation in *both* information and answer exchanges, we find that in the Circle-AC net, all but two of the groups which achieved hierarchical patterns in their information exchanges also used hierarchical patterns in their answer exchanges. Thus, 40 per cent of the Circle-AC groups used three-level hierarchies for both information and answer exchanges. Fourteen per cent of the Circle groups did the same, and 85 per cent of the All-channel groups used either two- or three-level hierarchies for both types of exchange. The differences between pairs of types of groups are all statistically significant by the chi-square test.

These findings indicate that there was considerably more organization within the Circle-AC groups than the aggregated times revealed. Although the differentiation of Circle-AC groups into hierarchical patterns was not as extensive as the differentiation of All-channel groups, it was considerably more extensive than the differentiation achieved in the Circle groups.

How did the time scores of the eight Circle-AC groups which did organize both information and answer exchanges compare with the time scores for those Circle and All-channel groups which organized? The Circle-AC organized groups averaged .48 minutes in their three fastest trials. This is not significantly different from the average of .49 minutes for the 17 All-channel groups or from the average of .47 minutes for the three organized Circle groups.

The times in the unorganized Circle-AC groups were sufficiently high to balance off the excellent performance of the eight organized groups.

A discontinuity in the distribution of average times for the three fastest trials for the Circle-AC groups was reported above. All seven groups whose averages were low enough to approximate the motion study estimate of trial time were organized. One group that averaged .78 minutes per trial for the three fastest trials actually differentiated into three-level hierarchies, but was very slow in sending messages. The contamination by this slow group makes even more impressive the fact that the average for all eight organized groups in the Circle-AC net is not significantly different from those of the organized groups in the All-Channel and Circle nets.

This finding suggests that an analysis of intertrial planning activities may provide clues to the higher degree of organization among Circle-AC groups than among Circle groups. Was the same planning mechanism at work in those Circle-AC groups which organized as in the All-channel

groups? Was the failure to organize in the Circle-AC net due to the same planning inadequacies as failure to organize in the Circle net?

Intertrial Activity

Before analyzing the planning messages, it is appropriate to ask whether the intertrial setting within which Circle-AC groups planned was comparable to the setting for All-channel and Circle groups. The right-hand columns of Table 1 (*supra*, p. 185) show the distribution of intertrial message units for the Circle-AC groups. In volume of intertrial messages, the Circle-AC groups exceeded both the All-channel and the Circle groups. The percentage distribution, however, was quite similar; the biggest difference was in the de-emphasis of "organizational" messages in the Circle-AC groups with a proportional shift of messages to the other categories. The absolute number of organizational messages sent, however, was greater in the Circle-AC groups than in the Circle groups.

A detailed analysis of the organizational messages from Circle-AC groups is presented in the right-hand columns of Table 2 (*supra*, p. 186). We note for these groups relatively more "perception-of-structure" messages and relatively fewer "planning" messages than found in the All-channel groups. We also note, within the "planning" category, relatively few messages devoted to promulgation of proposals. There were more specific proposals of organizational arrangements in the Circle-AC groups than in the Circle groups, although the average total of specific proposals per group for Circle-AC groups was less than half the average total per group for All-channel groups.

These "midway" results reflect the Circle-AC groups' midway achievements in organizational differentiation, as described above in the section on "Organizational Arrangement."

Was the planning process by which the Circle-AC groups organized themselves similar to the one used by the Circle and All-channel groups? Some answers to this question are suggested by the bottom sections of Tables 3 and 4.

The Circle-AC groups which eventually organized into hierarchies did not differ from the groups which failed to organize with respect to the volume of intertrial messages that they exchanged about their "perceptions of structure" (Table 3, *supra*, p. 187). This confirms our earlier finding in other nets that although knowledge of imposed and evolved structure may be needed to organize, such knowledge is not itself sufficient to ensure establishment of a differentiated organization.

The volume of general proposals, although it decreased over the course of the experiment, was approximately the same for both organized and unorganized groups in the Circle-AC net before the time of organization

(Table 4, *supra*, p. 189). As we noted before for other types of groups, the general proposals may facilitate organization; but they are not sufficient within themselves to induce organization.

These observations bring us to the point of checking the main hypothesis that we derived from the first experiment; namely, that the original Circle groups failed to organize because communication restrictions during the intertrial periods hindered the relaying of "specific proposal" and "promulgation" messages. The Circle-AC variation was designed to test whether complete freedom of communication (via an "all-channel" net) during intertrial periods would allow groups to organize for efficient performance in a "circle" net during task trials. Use of an "all-channel" net during the intertrial periods made relaying of messages theoretically unnecessary as a means of spreading proposals to the entire groups.

The results are shown in Table 4. The eight Circle-AC groups which eventually organized both information and answer exchanges used an average of 1.44 ($\sigma = 0.56$) specific proposing and promulgating messages per intertrial period *before* they organized, and an average of only 0.16 ($\sigma = 0.32$) such messages *after* they organized. The *before-after* difference is statistically significant. These results contrast with much larger average numbers of specific proposals and promulgations per intertrial period sent *before* (mean = 2.98; $\sigma = 3.48$) and *after* (mean = 0.29; $\sigma = 0.56$) organization by the 13 All-channel groups which eventually did organize. The results also contrast with the numbers of such messages per intertrial period sent by members of the Circle-AC groups which did not organize. For these eleven groups, the average for *early* intertrial periods ("before organization") was 0.60 ($\sigma = 0.76$). This did not differ significantly from the average for *late* intertrial periods ("after organization"), 0.30 ($\sigma = 0.53$).

Thus, as in the original Circle net, the groups in the Circle-AC net that organized into hierarchical patterns were characterized (in comparison with the groups that failed to organize) by a higher volume of intertrial messages devoted to specific proposals for organizing and to the promulgation of such proposals. Yet even for the Circle-AC groups that organized, their average volume of proposals and promulgations was only half the volume sent by the All-channel groups which organized (although the difference between means, 1.44 vs. 2.98 messages per intertrial period before organization, is not statistically significant). Merely giving the Circle-AC groups complete freedom of communication during the intertrial periods did not, in general, induce as high a volume of specific proposals and promulgations as the same unrestricted net induced in the All-channel groups. Why did the Circle-AC groups, under the same net conditions

during the intertrial periods as the All-channel groups, send fewer of the two critical types of messages?

The Noninterchangeability of Participants

We cannot explain the low volume of specific proposals and promulgating messages in terms of a low propensity for message sending, because in the aggregate, the Circle-AC groups exchanged more intertrial messages than the All-channel groups (Table 1, *supra*, p. 185). One major difference between the Circle-AC and the All-channel groups remains: the Circle-AC groups had to operate in a "circle" net during the trial periods. Could differences in intertrial message patterns and in success at organization have been a consequence of the difference in communication restrictions imposed during the task-trial periods?

The net imposed during the task trials restricted the persons who might serve as relayers of information or answers once an individual had been established as key man. In the All-channel net, a potential key man could choose any two of the other four participants as relayers in a three-level hierarchy. In the Circle-AC net, however, a potential key man had no choice: as Figure 3 shows (*supra*, p. 179); he had to use the persons to his immediate left and right.

The participants in each group were assembled randomly. There probably were large differences among participants with respect to various personal characteristics that would make some better relayers than others. In the All-channel net, the two participants who might make the best relayers could be fitted into that role. The communication net imposed no restrictions on their selection, given any man as potential key man. But in the Circle-AC net, the potential key man had only one chance in six that the two men seated on either side of him would be optimally suited for the relaying positions. Thus in the Circle-AC net, a potential key man has only one sixth the chance that a potential key man in the All-channel net had to secure the most suitable pair of relayers. This approximation, of course, overestimates the advantage within the All-channel net; for even though that net permits any pair of the available quartet to become relayers, other factors may prevent an optimal selection.

On the basis of specific proposals for organizing made during the first eight intertrial periods, it is possible to identify potential key men in the Circle-AC net: 32 persons, of the 100 involved in the groups, suggested themselves in at least three separate messages for the position of key man. (Of these 32 individuals, only 10 became actual key men.) Given these 32 potential key men, it is possible to identify the 64 potential relayers by the seating arrangements used during the experiment. Because there was more than one potential key man per group (32 for the 20 groups), there

was overlap among the potential relayers. By identifying individuals, we find that 53 *different* persons were involved as potential relayers.

It is possible to make a concrete check on our *post hoc* hypothesis that the noninterchangeability of relayers influenced the success that Circle-AC groups had in organizing themselves. We have used the data on intellective ability—one characteristic of participants which was varied systematically within each group (*supra*, p. 176). Of the 53 persons identified as potential relayers, we distinguished 25 who became actual relayers by the end of the experiment from the remaining 28, who failed. The ACE scores of the two groups were compared. The potential relayers who eventually became actual relayers averaged 123.5 ($\sigma = 22.7$). The potential relayers who failed to become actual relayers averaged 135.0 ($\sigma = 20.0$). The difference between the averages almost reaches statistical significance.⁷

Apparently in those situations where the potential leaders were seated between the intellectually more able potential relayers, there was more difficulty in establishing a hierarchical organization. This finding is complemented by the fact that only 16 per cent of the potential relayers who became actual relayers were simultaneously potential key men. In contrast, 43 per cent of the potential relayers who failed to become actual relayers were simultaneously potential key men. The more able, ambitious participants tended not to work out as relayers.⁸

Analogous checks were made of other personal characteristics of potential relayers: degree of ascendance (Guilford-Zimmerman scale), initial tendency (during first eight intertrial periods) to send promulgating messages, and initial task message fluency (during first two task trials). None of the three characteristics was related to subsequent service as relayers.

Of the measures available, these three seemed most likely to be related

⁷ The same analysis was applied to the All-channel groups. We found that the potential relayers who eventually became actual relayers averaged 128.4 ($\sigma = 20.7$) in their ACE scores while those who failed to become actual relayers averaged 124.1 ($\sigma = 15.2$). The difference is in the same direction as the difference for the Circle-AC groups, but it is too small to be statistically significant. Perhaps the intelligence effect washed out in the All-channel groups because all four participants in each group were considered as potential relayers, once a potential key man was identified.

⁸ When the same analysis was applied to the Circle groups, the respective percentages were 21 and 33. The ordering of percentages was reversed in the All-channel groups; 56 per cent of the potential relayers who became actual relayers were simultaneously potential key men while only 45 per cent of the potential relayers who failed to become actual relayers were potential key men. Again the effect disappeared when communication restrictions were removed during the task trials (see footnote 7). The combined results for Circle and for Circle-AC groups were significantly different from those obtained in the All-channel groups (chi-square test). It seems that in the All-channel groups, where there was much freedom in selecting persons for particular roles, the likelihood of a person's becoming a relayer was not related to his ability (ACE score) or ambition (as expressed by being a potential leader).

to success as relayers. There are perhaps other personal characteristics related to success which we have not appraised.

CONCLUSIONS AND DISCUSSION

Organizational Stability vs. Organizational Arrangement

In an earlier report (5, p. 243 and p. 250), a clear difference was pointed out between the establishment of stable patterns of interaction in a group and the achievement of a differentiated organizational structure. The results of the initial experiment demonstrated that although stability was a prerequisite to the structural development of groups, stability might also be achieved at a primitive, undifferentiated level of organization (5, Table 3 vs. Table 4).

The difference between stability and organizational arrangement appears again when we contrast the Circle-AC groups of the second experiment with the Circle groups of the first. The stability level of the Circle-AC groups was almost identical to that obtained in the Circle groups. Yet the degrees of structural differentiation of the two sets of groups, within stable and semistable series of task interactions, were quite different.

This distinction between stability and pattern differentiation may have an important role in the future growth of organizational behavior theory. For example, it will be important to examine whether stability has a restraining effect upon differentiation. Do groups which stabilize early in their development prematurely freeze themselves into less well-adapted organizational arrangements than groups which remain more flexible? An incidental finding of our experiments is that in the Circle and in the Circle-AC nets, the groups which eventually organized into hierarchical structures differed *during the first four task trials* from those which failed to organize. The former groups showed significantly more *instability* in the channels used for sending answers but more *stability* in the channels used for sending information during these initial trials. This finding needs further study, since no such differences in initial stability appeared in the All-channel net between groups which did and did not organize.

Testing a Hypothesis of Homans

Another aspect of organizational development was the amount of social, or nontask-relevant, interaction among group members during the intertrial periods. One consideration which led us to code the number of social messages exchanged during the intertrial periods was an interest in checking Homans' hypothesis:

If the interactions between the members of a group are frequent in the external system, sentiments of liking will grow up between them, and these sentiments will

lead in turn to further interactions, over and above the interactions of the external system.⁹

The interactions of the "external system" in our experiment, as we interpret Homans' model, were the task messages and the intertrial messages with social messages omitted. Homans is careful to point out that he postulates the relationship only when the group is a "going concern" (7, p. 306).

It is possible to test Homans' hypothesis by comparing the average number of social messages sent per trial by All-channel and by Circle-AC groups *before* they reached stability in their interactions with the average number of social messages sent per trial *after* they reached stability. We predicted that there would be a significant increase in the number of social messages after the external system had forced interactions and after the organizations had stabilized. Only the 21 groups which attained stability early enough to allow at least four task trials after its attainment were used in the analysis. The average number of social messages sent per intertrial period by the 21 groups was .57 ($\sigma = 1.54$) *before* stability. This average increased about twofold to 1.11 messages per intertrial period ($\sigma = 1.95$) *after* stability had been reached. The difference between means is statistically significant. The results are diagrammed in Figure 5. There is no contradiction of Homans' basic proposition.

Homans does not make explicit the mechanism through which task interaction leads to greater sociability, except to specify the intervening role of sentiment. In the experimental groups, could the increase in social messages have been a result of a reduction in the load of other kinds of communication in the intertrial periods?

If the subjects felt themselves ready to go on to the next trial before the 2-minute intertrial period had ended, they were permitted to signal such wishes to the experimenter. In the 21 groups used for testing Homans' hypothesis, an average of 60 per cent of the subjects were "ready to go" early in intertrial periods *before* stability had been reached; and 81 per cent were ready early in the intertrial periods *after* stability had been reached. Does this difference suggest a significant reduction in the pressure for nonsocial intertrial messages and, consequently, an explanation for the doubled volume of social messages?

In the 21 groups, the average number of nonsocial intertrial messages per trial per group dropped from 1.72 ($\sigma = 0.71$) during the four intertrial periods *before* stability was reached to 0.97 ($\sigma = 0.60$) from the four intertrial periods *after* stability. The decrease is statistically significant.

The evidence suggests then that the increase in interactions of the "internal system" (social relationships) may have been in response to the

⁹ G. C. Homans (7), p. 112. A more formal construction of the model is given by Simon (13).

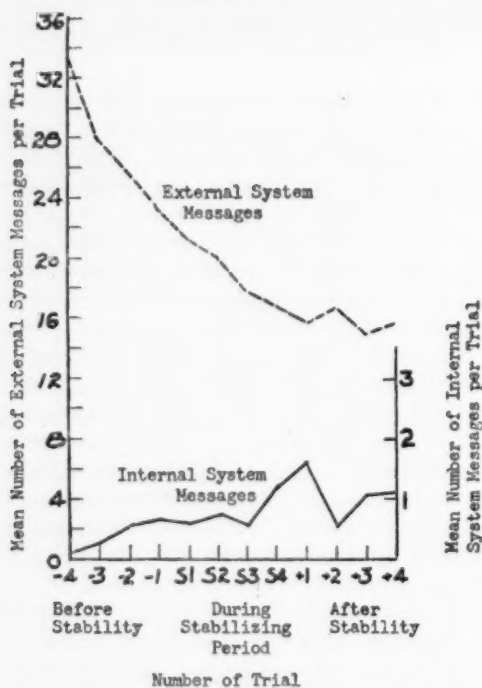


FIG. 5. Comparison of interaction of "external system" with interaction of "internal system"

decrease in the interactions of the "external system" (task, organizational, and motivational relationships) in the experimental situation.

Local Learning vs. Planning in Organizational Development

Our two experiments yielded evidence that both local learning and planning play a part in the development of organizational structures. We found that members tended to supply information to those who rewarded such messages with answers, a process prototypic of reinforcement learning.¹⁰ In our experiments, the more rote-like learning was apparently complemented by active use of planning devices, especially as embodied in the making of specific proposals and in the promulgation of these proposals.

Either of these two contrasting mechanisms may be involved to quite

¹⁰ Note in Figure 4 that for the Circle-AC groups, just as for the Wheel and Circle groups, the reduction in number of task messages over successive trials was entirely due to reductions in information messages.

different extents in the development of stabilized, differentiated structures. Christie, Luce, and Macy (3) at MIT have obtained results that contrast strikingly with ours. They modified the original Bavelas-Leavitt experimental procedure so that no organizing messages could be sent. They also changed the operating task by prohibiting answer messages and by requiring that each member know the information (or "missing symbol") of each of the others. Thus each member built, in isolation, his own concepts of the net and of the operating structure of the group from the task messages which he received from others. He had no opportunity to communicate with others about his perceptions and plans.¹¹ The experiments, then, were designed to reduce the importance of the insightful, shared organizing process and to enhance the role of conditioning-type learning.

In such an experimental situation, our theory of organizational development indicates that the superiority of the All-channel groups over the Circle groups in being freer to exchange plans for organizing with each other would disappear. Under the Christie, Luce, and Macy conditions, when no organizing messages are permitted, the extra channels available to All-channel groups would seem to be more a handicap than an asset. These "extra" channels would need to be eliminated to develop an efficient hierarchical structure.

This conclusion is confirmed in the MIT data (3, pp. 43-44). After 25 trials, almost all the Circle groups had reduced their messages to within one of the minimum needed; but in their All-channel ("totally connected") groups, there was little evidence of learning by the end of the experiment.

This result is a complete reversal of the findings in our experiments—but not in any way a contradiction. The impact of the communication net on the ability of a group to organize depends on the type of mechanism used by the group to develop their organizational structure. In our experiments we see the efficacy of a planning mechanism in cases when the net allows participants to behave insightfully, with consideration of "conditions in the net far removed" from the immediate locus of decision-making (2, Fig. 3 vs. Fig. 4). When a group's planning activity is limited to the "locally rational" as was done in the MIT experiments, the group cannot help but fail when the imposed organizational task demands insight.

Even in the Christie, Luce, and Macy variations, despite attempts to reduce the operation of an insight mechanism, there is evidence that learning at times was discontinuous, with a very rapid shift from "failure" to "success" (3, p. 53). Is this discontinuity a reflection of the development of insight? Such discontinuities are typical of insight experiences as contrasted with the usual gradual extinction of erroneous responses common

¹¹ The details of their modifications are clearly summarized by Christie (2), pp. 189-190.

to learning by association (9, p. 47). Perhaps even in their experiments as in ours, both mechanisms—insightful planning and localized rote-learning—were operative, despite intentions to focus on one of the two underlying processes.

Mechanisms by Which Communication Restrictions Affect Organizational Development

In an earlier paper, our original hypothesis was stated: "Imposition of certain restrictions on the communication channels available to a group affects the efficiency of the group's performance, *not directly* by limiting the potential efficiency of task performance with optimal organization in the given net, *but indirectly* by handicapping its ability to organize itself for efficient task performance."¹²

The analyses presented above indicate at least two major ways in which the indirect interference of the communication restriction evidences itself: (1) by reducing the volume of specific suggestions made for organization and by hindering promulgation of the planning idea through the group, and (2) by reducing the readiness with which persons more adequately suited for particular positions in a net may achieve optimal placement within the developing organization.

The finding of noninterchangeability of participants in our experiments is the first experimental demonstration (to the knowledge of the authors) of the applicability of the situational approach to nonleader roles. Recently, Rosenberg, Erlick, and Berkowitz demonstrated a general "assembly" effect, arguing that "some individual might contribute differently to the group product depending on the other individuals with whom he is assembled" (11, p. 195). Our results have shown another way in which such an assembly effect might be induced. The potential contribution of an individual will not only depend upon *who else* is in the group, but it will also depend on the *communication net* within which he is working. Thus, it seems that there are at least two mechanisms which generate an "assembly effect," to use the Rosenberg, Erlick, and Berkowitz terminology: (1) differences in individual contribution because of differences in other individuals with whom a person is "assembled," and (2) differences in individual contribution because of different ways in which a person may be "assembled" (structured in his interactions) with others.

SUMMARY

Analyses of mechanisms by which task-oriented groups developed interaction structures for task performance yielded evidence for the following propositions about organizational behavior:

¹² See (5), pp. 233-234. Roby and Lanzetta have independently proposed a similar hypothesis to explain results from one of their experiments (10, p. 112).

1. Severe restrictions on communication opportunities (beyond the minimum required for task performance) tend to induce organizational development through a local learning mechanism. Freedom in communication, in contrast, tends to induce organizational development through insightful, planning mechanisms.
2. Examination of the planning mechanism indicates that an understanding of imposed and evolved organizational structure and a flow of general comments and evaluations relating to the organizational situation may be necessary for the establishment of differentiated, hierarchical structures. They are not, however, sufficient. In the environmental situations examined in our experiments, it seems imperative that *specific* proposals for arrangement of the organization be made and then *promulgated* among the participants. Communication restrictions which require participants to organize even to communicate about organizational matters tend to reduce the volume of specific planning proposals and promulgating messages. Thus, such restrictions delay the development of differentiated structures.
3. When the imposed communication net restricts the selection of optimal persons for particular positions in the organization, the establishment of social structure is retarded.

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A Procedure for Clique Detection Using the Group Matrix

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INTRODUCTION

One of the unsolved problems of the matrix manipulation of sociometric data is the complete identification of cliques. Several discussions of this problem may be found in the literature (1, 2, 5, 8).

We consider any binary interpersonal relationship among members of a group with the property that two given members are either in this relationship or are not in it. Relationships such as communication, power, or sociometric choice belong to this category and can be represented by a matrix in which all the elements are either 0 or 1. If there are n persons in the group, then the matrix is square of order n and the element in the i, j cell is taken as 1 if and only if person i is in the given relation to person j , and is 0 otherwise. The elements lying in the diagonal are 0 by convention. This matrix will be called the *group matrix* under the given relation. A *clique* (as defined in (1)) is a maximal subgroup of at least three members in which each member is in the relation to every other member.

Forsythe and Katz (2) were among the first to utilize this group matrix in connection with the analysis of sociometric data. Luce (5) derived some interesting results concerning subgroups which tend to approximate cliques. Weiss and Jacobson (8) developed an empirical method for the approximate determination of cliques by transforming the group matrix into an equivalent matrix in which one may detect clustering along the main diagonal.

We propose in this paper to obtain results which extend those obtained in Festinger (1). Festinger's principle result was the theorem that each of the elements in the diagonal of the cube of the group matrix of a clique is the number $(n - 1)(n - 2)$, where n is the number of clique members. His results, however, are limited to those cases in which there is but one clique or disjoint cliques.

Our first step is the development of a method which identifies all the cliques in those groups in which not more than three cliques exist. We then propose an inductive method which reduces the general case to the preceding one. After combining these two procedures, we conclude with an example which illustrates the entire methodology.

Uniclqual Persons

Since our problem is to find the cliques of a given group, we will begin by showing how to obtain from the group matrix a matrix which contains only those people who are in at least one clique. Using this submatrix, we will then successively handle the cases in which a given group has exactly one, two, or three cliques, respectively. For this purpose we need the following definitions. A *noncliquel person* is one who does not belong to any clique; a *uniclqual person* is one who belongs to exactly one of the cliques of a group; and a *multiclqual person* belongs to more than one clique. Two persons are *coclqual* if they are fellow members of at least one clique.

Let A denote the matrix of a given group with regard to the relation under study. Let S be that matrix obtained from A by changing those i, j elements 1 in the matrix A to 0 whenever the element in the j, i place is 0. Thus S is the matrix which presents only the reciprocated choices in the group (if sociometric choice is the relation at hand). It is possible to define S symbolically. For this purpose we require the definitions of some useful matrix operations. By the *transpose* A' of a given matrix A , we mean that matrix obtained from A by interchanging rows and columns. Thus if

$$A = \begin{vmatrix} 0 & 1 & 1 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{vmatrix}$$

then

$$A' = \begin{vmatrix} 0 & 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{vmatrix}$$

The elementwise product, written $A \times B$, of two matrices A and B of the same size is that matrix whose i, j entry is the product of the corresponding entries of A and B . We illustrate elementwise multiplication by writing the matrix $A \times A'$ using the preceding two matrices:

$$A \times A' = \begin{vmatrix} 0 & 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{vmatrix}$$

If one regards this matrix A as the sociomatrix of a group, then the person P_5 represented by the fifth row is an isolate, and P_4 receives unreciprocated choices from P_1 and P_3 , while P_1 , P_2 , and P_3 all choose each other mutually.

Thus the matrix $A \times A'$ is precisely the matrix of reciprocated choices. Hence we have the alternative definition:

$$S = A \times A'.$$

All the dyads of the group are given in the matrix S . However not all these dyads need be part of a clique.

We now construct the matrix $S^2 \times S$. It is clear that the i, j entry of this matrix is zero if and only if person i and person j are not coclique, and is positive otherwise. Consequently, all those group members whose row in $S^2 \times S$ consists entirely of zeros are noncliqueal persons. Let M be the submatrix of $S^2 \times S$ obtained by deleting from it the rows and columns corresponding to every noncliqueal person. We note that in accordance with the results in Festinger (1), we would obtain the same results if we deleted those rows and columns from $S^2 \times S$ of all persons whose entry in the diagonal of S^3 is zero. This follows from the fact that the sum of the elements in any row of M is equal to the corresponding diagonal element of S^3 .

We now discuss the relationship between the existence of uncliqueal persons in a group and the number of cliques.

Theorem I. If group G has exactly one clique, all persons in submatrix M are uncliqueal.

Proof. By construction, all persons in M are members of at least one clique. By hypothesis, G has exactly one clique C .

Theorem II. If the group G has exactly two cliques, then each clique has at least one uncliqueal person.

Proof. If either clique contains no uncliqueal person, then it is properly included in the other clique, and contrary to the definition of clique, is not maximal.

Theorem III. If a group has exactly three cliques, then at least two of those cliques have uncliqueal persons.

Before proceeding to the proof of this theorem, we illustrate both of those cases which may occur. In Figure 1a, a group is depicted in which there are exactly three cliques and each of them contains a uncliqueal person. The group of Figure 1b contains exactly three cliques, but only two of them have uncliqueal persons and the third does not. (For simplicity, each clique in the two groups in Figure 1 is taken as containing only three persons.)

Proof¹. The proof is by contradiction. Let C_1 , C_2 , and C_3 be the three different cliques in the group and assume that the theorem is false. Then at least two of the cliques, say C_1 and C_2 , have no uncliqueal members.

¹ We are indebted to Herbert A. Simon for this concise proof of our theorem.

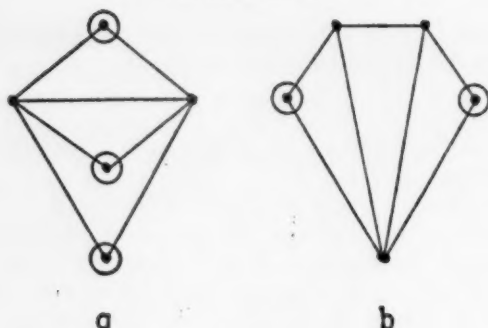


FIG. 1

Let T be the set of all persons in the group who belong to at least two cliques. Let A and B be distinct members of T . Then A belongs to at least two different cliques, and so does B . Since there are by hypothesis exactly three cliques, A and B must be coclical, for otherwise the group would require at least four different cliques. We have thus shown that every pair of members of T are coclical. Hence T is a clique or is contained in a clique.

Since C_1 and C_2 have no uniclqual members, all persons in C_1 are in T , and so are all persons in C_2 . Therefore either C_1 and C_2 are identical, or at least one of these two cliques is not maximal. In each of these alternatives, there is a contradiction of the hypothesis that the group has exactly three distinct cliques.

This theorem has a straightforward generalization whose proof is entirely analogous:

If a group has exactly k distinct cliques, then at least $k - 1$ of these cliques have members belonging to less than $(k + 1)/2$ cliques.

For example, in any group with exactly four distinct cliques, at least three of these cliques must have members belonging to two or fewer cliques.

The discussion of the possible occurrences of uniclqual persons in groups with more than three cliques is completed by the following observation.

Theorem IV. There exist groups with exactly four cliques in which any number of these cliques may have uniclqual persons.

The assertion is proved by the five groups depicted in Figure 2 in which groups (a), (b), (c), (d), (e) have respectively 4, 3, 2, 1, 0 cliques with uniclqual persons. For clarity all uniclqual persons in these five groups are represented by encircled points in Figure 2.

Clearly the result of IV also applies to groups with more than four cliques.

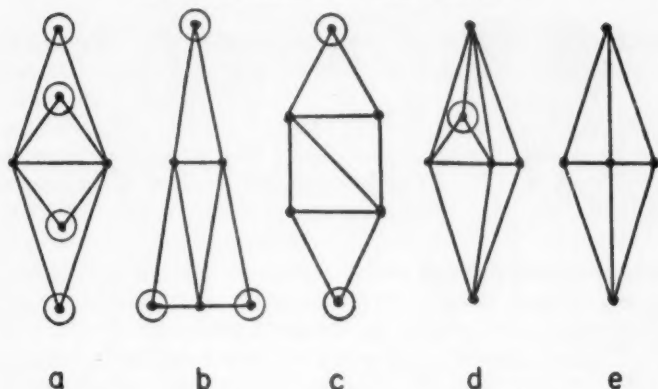


FIG. 2

Groups with Three Cliques or Less

Throughout this section, we take as an underlying assumption that we are dealing with a group G containing three or fewer cliques. By the methods of the preceding section we may also assume that every person in G belongs to at least one clique, and that the matrix M has been found.

By Theorems I, II, and III, the group G contains at least two uniclqual persons. We now describe an algorithm of five steps for the detection of the cliques of G . In order to describe this algorithm properly, we require the following operations from set theory.

The *union* of two sets S and T , written $S \cup T$, is the set consisting of all elements which lie in at least one of the two given sets. Their *intersection*, written $S \cap T$, is the set of all elements lying in both S and T . The set $S - T$ consists of all those elements of S which are not in T . These three set-theoretic operations are illustrated in Figure 3.

Step 1. Let P be any person whose row sum in M is minimal. Then P must be a uniclqual person. For if P is not uniclqual and belongs to cliques C_1 of size n_1 and C_2 of size n_2 , then the row sum in M of P is greater than both $(n_1 - 1)(n_1 - 2)$ and $(n_2 - 1)(n_2 - 2)$. But by Theorems I, II, and III, at least one of the cliques C_1 and C_2 , say C_1 , has a uniclqual person Q . The row sum in M of Q is therefore $(n_1 - 1)(n_1 - 2)$ which is less than that of P , contradicting the assertion that P has minimal row sum.

For any uniclqual person A , let C_A denote the clique to which A belongs. With this notation, the clique C_P consists of P , together with all those persons whose entry in P 's row in M is not zero. We have thus found one clique. If $C_P = G$, then G has exactly one clique, and the detection procedure is terminated.

Step 2. If, on the other hand, G contains persons not in this first clique



FIG. 3

C_P , then let Q be any person in $G - C_P$ whose row sum in M is minimal among these persons. Then again Q is clearly a uniclqual person, and we find the second clique C_Q using the matrix M as above.

Step 3. For any clique C of a group, let C' denote the set of all uniclqual persons in C , if any. Then the sets C'_P , C'_Q are both non-vacuous since they contain persons P , Q respectively. Hence the set C'_P consists of all persons in clique C_P whose row sum in M is equal to that of P ; the set C'_Q is found similarly.

Since $C_P \cap C_Q$, the set of common members of both of these cliques, does not contain any uniclqual persons, it follows that every person in $C_P \cap C_Q$ must be in the set $G - (C'_P \cup C'_Q)$. There are two possibilities: either these last two sets are the same or they are different. If they are the same, then G contains exactly two cliques C_P and C_Q and the algorithm is terminated at this point.

Step 4. If these two sets $C_P \cap C_Q$ and $G - (C'_P \cup C'_Q)$ are different then G contains exactly three cliques. In this case there are two possibilities: either there is at least one group member R in neither of the cliques C_P and C_Q already found, or there is no such person.

If there is such a person R , then he is uniclqual and we determine C_R as before to find the third and last clique of G .

Step 5. If there is no such person R , then $G = C_P \cup C_Q$ and the third clique is $G - (C'_P \cup C'_Q)$, the collection of all multiclqual persons in the group.

GENERAL PROCEDURE FOR ANY GROUP

Given any group G , we do not know in advance whether it has fewer than four cliques and therefore whether or not there is a uniclqual person. The general procedure uses the uniclqual persons of G , if any. Where there are none, G is decomposed into sufficiently small subgroups so that these subgroups must have uniclqual persons.

Let P be any person whose row sum in M is $r(P)$. Let $n(P)$ be the number of persons coclqual with P , excluding P . Then, by the result of Fester (1), P is a uniclqual person if and only if the following equation holds:

$$r(P) = n(P) [n(P) - 1]$$

We note that if P is not uniclqual, then $r(P)$ is less than the right-hand member. This result is essential for the first step of the following five-step method for clique identification:

Step 1. After calculating the matrix M of G , we examine the rows of M to determine whether or not G contains a uniclqual person. If it does, proceed to Step 2; if it does not, skip to Step 4.²

Step 2. Having the uniclqual person P , we find the clique C_P and the set C'_P as in the preceding section.

Step 3. If $C_P = G$, then G has only one clique and we go to Step 5.

If $C_P \neq G$, let $G_1 = G - C'_P$ and revert to Step 1.

Step 4. We are faced with a group G containing no uniclqual persons, and we have already calculated (in Step 1) its matrix M . Let P be any member of G such that $r(P)$ is minimal.³ We construct two subgroups (not necessarily mutually exclusive), each of which contains fewer cliques than G . Let $G(P)$ be the subgroup consisting of P and all persons coclqual with P . We determine $G(P)$ by the same device used in finding C_P in Step 2. Let $G(-P)$ be the subgroup consisting of the persons in cliques not containing P . The subgroup $G(-P)$ is the union of all sets $G(Q)$ for which Q is not in $G(P)$. Then $G = G(P) \cup G(-P)$, and each of the subgroups $G(P)$ and $G(-P)$ has fewer cliques than G .

Further, there are no cliques in both of these subgroups, for a clique cannot both contain and not contain P . Also by construction, no cliques are split between $G(P)$ and $G(-P)$; that is, there are no cliques having some members in $G(P)$ and others in $G(-P)$ which do not lie entirely in exactly one of these two subgroups.

Step 5. On arriving at this step from Step 4, we now have the two subgroups $G(P)$ and $G(-P)$. Send one of these to Step 1 and store the other.

When we are referred back to Step 5 from Step 3, send any stored subgroup to Step 1. If there are no subgroups in storage, the process is terminated.

COMBINATION METHOD

It is sometimes possible to expedite the detection of cliques by a combination of the two methods proposed above. This may be done by modifying the general procedure so that one can tell whether the given group has three or fewer cliques. Furthermore, the combination method will also simplify computation in those cases in which there are two cliques with uniclqual persons.

After Step 2 of the last section, we examine the row sums in M for the

² The cliques of some groups can be determined without ever using Step 4. An example of such a group is one in which every clique has a uniclqual person.

³ If we choose an arbitrary member of G , we may get a person who is in every clique, e.g., the central point in Figure 2e. This possibility is excluded by using minimal row sum.

persons in $G - C_P$. If a uniclqual person Q is found among these, we have located the two distinct cliques C_P and C_Q . If there is no such person Q , we know that G has more than three cliques and procede to Step 3.

If a Q is found, we form the subgroup $K = G - (C'_P \cup C'_Q)$. If this subgroup is the same as the set $C_P \cap C_Q$, then the group contains exactly two cliques, namely C_P and C_Q . But if the subgroup $K \neq C_P \cap C_Q$ and is itself a clique, then each pair of persons in it is cocliquish, and we know that the group has exactly the three cliques C_P , C_Q , and K .

Finally, if the subgroup $K \neq C_P \cap C_Q$ and contains two persons who are not cocliquish, then the group may have more than three cliques and the general method should be followed from the point at which cliques C_P and C_Q were determined.

Example

We apply our results to the detection of all the cliques in the contrived group G of Figure 4. We have deliberately chosen for our illustrative group G one in which each person is in at least one clique. Since the matrix A of this group is given by

$$A = \begin{array}{c|cccccccccc} & P_1 & P_2 & P_3 & P_4 & P_5 & P_6 & P_7 & P_8 & P_9 \\ \hline 0 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 1 & 1 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 1 & 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 1 & 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 1 & 1 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 1 & 1 & 1 & 1 & 0 \end{array}$$

one readily finds the corresponding matrix $M = A^2 \times A'$ to be

$$M = \begin{array}{c|cccccccccc} 0 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 1 & 2 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 2 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 2 & 2 & 0 & 2 & 2 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 2 & 0 & 3 & 2 & 2 & 10 \\ 0 & 0 & 0 & 1 & 2 & 3 & 0 & 2 & 2 & 10 \\ 0 & 0 & 0 & 0 & 0 & 2 & 2 & 0 & 2 & 6 \\ 0 & 0 & 0 & 0 & 0 & 2 & 2 & 2 & 2 & 6 \end{array}$$

Testing the first point P_1 against the equation:

$$r(P) = n(P) [n(P) - 1],$$

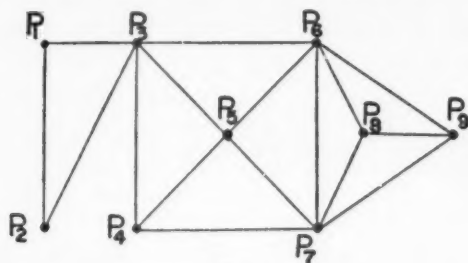


FIG. 4

we find the equality is verified since $r(P_1) = 2$ and $n(P_1) = 2$. Thus P_1 is uniclqual and

$$C_{P_1} = \{P_1, P_2, P_3\} \quad \text{and} \quad C'_{P_1} = \{P_1, P_2\}.$$

On testing P_4 , we find it is not uniclqual, nor are P_5 , P_6 , or P_7 . However we see that P_8 is uniclqual since $r(P_8) = 6$ and $n(P_8) = 3$. Thus P_8 plays the role of point Q in the combination method, and

$$C_{P_8} = \{P_6, P_7, P_8, P_9\} \quad \text{while} \quad C'_{P_8} = \{P_8, P_9\}.$$

Hence the subgroup $K = G - (C'_{P_1} \cup C'_{P_8})$ is $\{P_3, P_4, P_5, P_6, P_7\}$ which is therefore different from the intersection of the two cliques C_{P_1} and C_{P_8} (which is empty). Further since P_3 is not coiclqual with P_7 , there may be more than three cliques in G .

We now compute $M(K)$ obtaining:

$$M(K) = \begin{array}{c|ccccc|c} & P_3 & P_4 & P_5 & P_6 & P_7 & \text{row sums} \\ \hline 0 & 2 & 4 & 2 & 0 & 8 \\ 2 & 0 & 4 & 0 & 2 & 8 \\ 4 & 4 & 0 & 4 & 4 & 16 \\ 2 & 0 & 4 & 0 & 2 & 8 \\ 0 & 2 & 4 & 2 & 0 & 8 \end{array}$$

On testing each of these five points, we find that none of them is uniclqual, and turn to Step 4 of the general method. By the construction given there, $K(P_3)$, the subgroup of K consisting of all points coiclqual with P_3 , is:

$$K(P_3) = \{P_3, P_4, P_5, P_6\}$$

and

$$K(-P_3) = \{P_4, P_5, P_6, P_7\}.$$

For simplicity, let $H = K(P_3)$ and $J = K(-P_3)$. Proceeding to Step 5 of the general method, we store J and send H on to Step 1. Since

$$M(H) = \begin{array}{ccccc} & P_3 & P_4 & P_5 & P_6 & \text{row sums} \\ \begin{array}{l} 0 \\ 2 \\ 4 \\ 2 \end{array} & \begin{array}{l} 0 \\ 0 \\ 2 \\ 0 \end{array} & \begin{array}{l} 4 \\ 2 \\ 0 \\ 2 \end{array} & \begin{array}{l} 2 \\ 0 \\ 2 \\ 0 \end{array} & \begin{array}{l} 8 \\ 4 \\ 8 \\ 4 \end{array} \end{array}$$

it is clear that only P_4 and P_6 are uniclqual in H . These consist of

$$C_{P_4} = \{P_3, P_4, P_5\}, \quad C'_{P_4} = \{P_4\}, \quad C_{P_6} = \{P_3, P_5, P_6\} \text{ and } C'_{P_6} = \{P_6\}.$$

Since $H - (C'_{P_4} \cup C'_{P_6}) = C_{P_4} \cap C_{P_6}$ the subgroup H contains only these two cliques C_{P_4} and C_{P_6} . On returning to Step 5 and processing the subgroup J , we find similarly that J consists of the two cliques $\{P_4, P_5, P_7\}$ and $\{P_5, P_6, P_7\}$. The process is now terminated. Altogether the group G contains six distinct cliques, namely,

$$\begin{aligned} C_1 &= \{P_1, P_2, P_3\} \\ C_2 &= \{P_6, P_7, P_8, P_9\} \\ C_3 &= \{P_3, P_4, P_5\} \\ C_4 &= \{P_3, P_5, P_6\} \\ C_5 &= \{P_4, P_5, P_7\} \\ C_6 &= \{P_5, P_6, P_7\} \end{aligned}$$

SUMMARY

Festinger (1) shows that a group contains a clique if, and only if, not all the elements in the diagonal of the cube of the symmetric group matrix are zero. He also obtains the result that a group of m members is itself a single clique provided each element in this diagonal is $(m - 1)(m - 2)$. This approach is extended here to the determination of all the cliques in a group having three or fewer cliques using the concept of a uniclqual person. We are then able to remove this restriction on the number of cliques in a group by an inductive reduction method. Using a combination of these two methods, we can identify all the cliques in any group.

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Issues in the Concept of Need-Complementarity¹

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The recent work of Winch and his colleagues (16, 17, 27-31) brings the process of assortative mating in America into definitive focus. Previous studies showed that residential proximity favored the chances of marriage between two people (1, 4, 8, 9). A careful review of an extensive volume of existing research also confirmed strong endogamous trends among religious and ethnic groups and almost binding endogamous forces among age, race, and class groups (14). These demographic and cultural factors outline the major fields of prospective spouses. Winch (28, 29) and his associates (16) have now indicated that the choice of spouse within the field is not random, but reflects complementary personality needs of the couple. To be sure, one effort to replicate Winch's findings on a slightly different kind of sample proved unsuccessful (7). But, if the results of Winch's intensive analysis should be confirmed in future research, this would complete the gross determinates of who marries whom: people presumably select mates according to their (a) accessibility; their (b) *similar* status, values, and life experience; and their (c) *dissimilar* personality needs.

Winch's work on need-complementarity began with mate selection, perhaps as the prelude to a larger study of marital adjustment. But the basic concept has a wider relevance than sheer choice of spouse. Winch notes that mate selection is only a special case of selective association, and that his theory also applies to the *formation* of cliques, work teams, and other informal groups (30).

We may go even further: need complementarity may affect the *functioning* of any *small group* with a *diffuse role structure*—that is, where personality operates most freely as an independent variable in the social system. This may seem like a red herring to the strict structuralist who is convinced that, in the last analysis and regardless of personality, people behave mainly as they must in accordance with role requirements and limitations. This may be essentially true insofar as roles are formal, functionally specific, and embedded in large organizations. However, small groups with diffuse roles and informal relationships allow great amplitude for the free

¹ This paper benefits from a preliminary inquiry, supervised by Dr. Rhona Rapoport into personality "fit" and family functioning among a group of psychiatric patients at the Belmont Hospital Social Rehabilitation Unit in England (director, Dr. Maxwell Jones). The work is part of a larger project directed by Dr. Robert Rapoport and financed by funds from the Nuffield Foundation. I am indebted to the Drs. Sofer and Rapoport for helpful review of this paper.

play of personality factors, and thereby submit group attributes to the effects of personality variations.

The problem of the sociologist is to go beyond the conventional analysis which moves between personality and group as different analytic levels (with separate bodies of theory), and, instead, to abstract personality factors directly as *sociological* variables. The concept of need complementarity facilitates this.

By use of the *fit* between people's needs as an analytic unit, the concept focuses on *relationships*. This transcends sheer personal attributes and allows personality factors to be specified directly at the *group level of analysis*. This would help to clarify institutional settings which are most and least conducive to the satisfaction of different motives to which people are socialized—an issue underlying Melvin Tumin's recent controversy with Kingsley Davis about incentives, rewards and social integration (26).

Thus, in place of simple designations of the personality characteristics of group members, groups can be analyzed according to the patterns of fit between the members' personalities. Aside from the culture and personality studies, this is perhaps the most crucial sociological dimension of personality. If it does not literally convert personality into a concept of group structure, at least it enables a more systematic understanding of those strengths and strains in a system which are not reducible to structural elements like roles. We may then account for differences of performance, adjustment, morale, participation, stability, or cohesion among groups of comparable structure. For example, in one recent study of productivity, it was impossible to clarify performance variations among structurally similar work teams before personality factors were introduced to the role analysis (23). Likewise, it might be shown that among nominally similar families, differences of cohesion (as reflected in divorced and nondivorced groups) are not easily attributable to structural factors. The principal "variance," so to speak, must be taken up by other elements. Thus, need-complementarity is one means of abstracting personality factors as group phenomena which can then be related to other group attributes or functions. The concept thereby gains general methodological importance.

Winch is not the first sociologist to examine the effect of personality on the family or on problems of social systems (3, 10, 15, 20). His formulation, however, is a sound basis for definitive research. The personality variable is treated systematically, rather than as a residual category, and is eminently researchable. A level of generality is struck which goes beyond other valuable, but more limited, approaches to the type of problem which Winch addresses (18, 21, 25). His thoughtful work is one of the most viable links available between theory and research on personality in small groups and in family adjustment.

On these grounds alone, the concept of need-complementarity warrants careful review. Accordingly, this paper will consider some of its assumptions, implications, and some major issues which it opens up for study. We will indicate some key problems which a refined conceptual schema must take into account. Despite the concept's broader significance, the discussion will be confined to marital processes. While many factors may affect marital equilibrium (such as economic stability or shared cultural values), we are concerned with the influence of complementary personality needs immediately on mate selection and, ultimately, on marital integration.

The theory of need complementarity has been set forth elsewhere in considerable detail (16, 17, 27-31). It is fairly straightforward and requires no lengthy elaboration here. Briefly, it assumes that mutual attraction expresses the emotional needs of a couple. An individual will be most attracted to "that person who gives the greatest promise of providing him or her with maximum need gratification" (27). Presumably, this will most readily "occur between two people whose need patterns are different rather than similar" (16). This involves an emotional interdependence, but a subtler symbiosis than the simple maxim that "opposites attract." Apparently, each partner compensates for qualities lacking in the other, or else the gratification of one is attended by a concomitant gratification of the other. As couples satisfy these criteria, their chances of mutual attraction correspondingly increase. Although Winch does not make the point explicit, the satisfaction of these criteria should also govern the prospects of good marital adjustment (and this sphere is, naturally, more crucial than mate selection for the application of need complementarity).

Two types of complementarity are proposed: "... One based on difference in *intensity* [or amount] of identical needs, ... and the second type based on difference in *kind* of need" (16). For example:

It was hypothesized that a person high in dominance would be more likely to marry a person low in the same need (type I complementariness) than one who, like himself, was high in that need. Moreover, a person high in dominance would be more likely to marry someone high in deference than someone low in that need (type II complementariness) (20).

In effect, then, the partners should show a negative correlation with each other on the same need and a positive correlation with each other on contrasting needs. This is the essence of the theory.

PERSONALITY LEVELS

Winch does not try to settle the many thorny problems in the concept of need. He accepts Henry Murray's view of need (19) as an organizer of "perception, apperception, intellection, conation and action in such a way as to transform in a certain direction an existing, unsatisfying situation"

(30). Accordingly, Winch defines need in a tension-reduction framework simply as a "goal-oriented drive [to] any state of affairs which the individual senses would be more gratifying than the 'existing, unsatisfying situation' " (30).

To test his general proposition, Winch adapts a dozen of Murray's "standard" need categories and adds three "general traits" to complete his operational variables. The dozen needs are: abasement, achievement, approach, autonomy, deference, dominance, hostility, nurturance, recognition, status aspiration, status striving, and succorance. Sex was originally included in the list, but was later dropped because too many other discrete needs are bound up with it. The three general traits are: anxiety, emotionality, and vicariousness. The subjects were rated on each variable on the basis of data from three instruments: a "need interview," a case history, and a TAT. This rating is basically a simple index of whether a person is high or low on a particular need. The needs of each spouse were then correlated with those of the other.

This procedure by-passes some, but not all, of the complexities of need theory. Above all, the flat list of needs obscures the "level" of personality on which a need operates. Thereby, "superficial" needs (including many cultural values) are not easily distinguished from "deeper," and presumably stronger, motives (like those rooted in a "fund-of-energy" theory of personality, such as the Freudian).

The failure to locate needs in depth may seriously prejudice the apparent relationship between *need organization* and *behavior* (that is, mate selection). From Freudian theory and clinical practice, it is evident that behavior may reflect either manifest or latent needs, regardless of the person's awareness or the overtness of the need's expression. Some fundamental needs are concealed by sublimation or "denied" by reaction formations. As a result, people with the same basic needs can show either similar or drastically different behavior (that is, choose different kinds of spouses)—as Winch explicitly observes (27). As an illustration, he indicates that a passive dependent male who accepts his needs may seek a nurturant, maternal wife, while one who rejects them may seek a clinging, dependent spouse (30). Ktsanes also notes this complication (17). Thus, overt behavior may seriously distort the need picture.

Winch apparently made some effort to overcome this problem. Some of the fifteen needs were rated "with respect to direct or 'overt' expression and indirect or 'covert' expression" (16). Here, expression is tantamount to awareness. In the interests of operational simplicity, the three Freudian levels (conscious, unconscious, and preconscious) were simply dichotomized into overt and covert levels of awareness (30). This may be gratuitous, however, because *expression* or *awareness* neither clarifies the *organization* of

basic needs nor consistently indicates the personality level on which a need operates. So the rating does not reliably distinguish the need level which governs the behavior.

There is little difficulty when manifest and latent needs are the same, but any difference between them presents a problem. The uncertain level of a need drastically limits our ability to interpret any findings with confidence. If we do not know the level of need we are dealing with, we do not know which level is shaping the behavior we are trying to explain. We do not know when we are using superficial and when basic needs in our explanations. For, in judging the complement of a need, we do not know when we are matching it with a spouse's need on the same level and when with its opposite on a different level. One person's manifest needs can be inadvertently compared with the latent needs of the spouse. In one case, the needs might seem complementary, and in another, they would not. But there is no principle to distinguish them. This becomes a major source of possible error, both in increasing spurious complementarity and in concealing genuine complementarity. There is no reason to expect these errors to cancel each other out.

Some significant variable intervenes between need organization and behavior. This is the person's adjustment to his basic need structure, whether his accommodation is conscious or not. We may call this intervening variable "self-acceptance."

Such a variable can help to standardize the data by minimizing the effect of discrepancies between manifest and latent needs. In operations, the need picture based on TAT, "need interview," and case history can be supplemented by something like an "ego ideal" picture. This might be drawn from even a simple paper-pencil questionnaire of items which refer to the *content* of need categories. The subject would answer these items in terms of what he would *ideally want* to be like. This is firm manifest-level material. The three existing instruments (TAT, etc.) could then be analyzed solely for deeper level material which would be used for the need ratings. Discrepancies between a subject's basic needs and his ideal need profile would give a first approximation of manifest-latent differences, and would allow "expression" of needs to be dropped as a separate variable. Some control could then be imposed over the level of needs being compared between spouses. While this is no final solution, it might be an initial stop-gap to help control error and to indicate the kinds of people who choose mates according to their manifest or latent needs.

EQUILIBRIUM

A second series of problems concerns family equilibrium, both within the marriage and between the family and outside. Winch specifically does *not*

assume that his subjects have *general* needs which are common to many situations, but he simply notes the situation in which a need is active. By taking "account . . . of the expected locus of gratification (or situation)" (30), needs can be rated strictly as they appear within the marriage. Accordingly, a need is related to the subject's expectations and whether he seeks a particular gratification in marriage or elsewhere. Thus, Winch rates some needs in terms of their predominate locus or "direction" of expression, i.e., inside or outside the marriage (16). The dichotomized variables are enumerated in (31). He then hypothesizes that the needs to be gratified within the marriage are a function of those satisfied outside (27), and that the greater the external gratifications, the less intra-marital complementarity is necessary for cohesion—above a necessary minimum (17).

This deft approach raises several complex problems. Not the least of these is the operational assumption that people do not have *general* personality needs, but segregate these according to different social roles and gratify them on a role-specific basis, that is, some needs in one role and others in another. The assumption is warranted for those roles which activate needs selectively and afford the opportunity to gratify certain needs more than others. The assumption is tenuous for roles which provide the opportunity to satisfy a broad range of needs. This is a long-standing problem of great uncertainty which still awaits appreciable study and documentation. Roles may vary considerably in their gratification potential, but this variation may primarily distinguish the most highly structured, segmental roles from all others. The others may offer great scope for need projection. In this respect, even the highly formalized roles in large organizations may be fairly flexible, as the extensive literature on informal systems in bureaucracies indicates.

Furthermore, certain personality needs may well be pervasive and cross-cut many roles. More important, perhaps, is the large, though indeterminate, proportion of people who actually segregate their needs minimally, who pursue the same kinds of satisfactions in many situations, regardless of their role shifts. For example, one hallmark of neurotic behavior is its "inappropriateness" to the situation. The person fails to conform to others' expectations precisely because he seeks gratifications more appropriate to other roles. Or, quite apart from neurotic behavior, a person with, say, strong dominance needs might be dominant in most of his relationships simply as a function of a pervasive personality need. In both examples, a fairly general adjustment pattern recurs across many roles, sometimes indiscriminately and sometimes in marked opposition to conventional expectations. Thus, people may treat needs as if these were pervasive and fairly independent of specific roles.

The value of the assumption that individual subjects have no general

system of needs seems moot. It usefully simplified Winch's operations and enabled him to examine his sample's needs purely in the marital context. But further studies and other family research might suffer from this premise.

Actually, there are at least four kinds of complementarity—or need equilibrium—which affect marital cohesion. These four types which we will enumerate may have quite different effects on marital relations and stability.

(A) The first of these is the complementarity which Winch studies. This refers to the emotional integration of two people strictly in their *personal relations to each other*. High dominance needs are complemented by low dominance or high deference, high nurturance needs by low nurturance or high succorance, etc. One spouse's "plus" needs are ideally balanced by the other's "minuses."

Complementarity may also refer to the composite needs of a couple when the spouses are analyzed as a "team" in the face of demands or expectations which others have of them. This has two aspects. (B) When spouses' needs are taken together and pooled, these can be seen as a set of resources with which external demands are met. In this sense, the pooled needs constitute a repertoire of skills or capacities with which first one spouse, then the other, may *act on behalf of both*. The strengths of one spouse may compensate for the deficiencies of the other in dealing with the external world, and may promote an emotionally optimal division of labor and responsibility. Thus, each person alternately acts as a representative of the pair vis-a-vis others. (C) In addition, many aspects of married life cast the spouses together into their joint role as a couple. Complementarity then refers to their joint needs *as a couple in relation to others*, either within the family or outside. The spouses' pooled needs then become a condition of their agreement or disagreement in situations which require or in which others expect them to act in concert as a couple.

A given pattern of complementarity may have a different effect on marital equilibrium in each of these first three contexts. For example, in Winch's terms, a mixture of high and low needs for status striving may have no direct effect on the purely personal relations between the spouses, that is, when they are acting solely with reference to each other. But such an apparently "good inter-personal fit" might have drastic effects on their compatibility when others are involved, specifically in their preferred life style, social activities, voluntary associations, and even occupation. Similarly, different dominance or nurturance needs of the spouses might foster their strictly inter-personal adjustment, but be profoundly disruptive in child rearing. Thus, some patterns of high complementarity can have deep repercussions in marital strain and instability when others are involved. This may be a major source of conflict in mixed marriages. It is primarily

in relation to outsiders that personality differences which are culturally rooted may come to the fore.

Sociologists have traditionally analyzed such problems in terms of value consensus, i.e., as functions of spouses' respective cultural histories. Cultural norms about proper familial role behavior allow an extremely broad range of individual adjustments (5, 6), and the scope of personality needs in determining role relations may be greater here than in any other major institutional setting. While the effect of personality on the commitment to value systems has been examined largely in relation to ideology (2, 24), Winch's analysis directs attention to the role of personality needs as a determinate of values within the family.

(D) In the final context of complementarity, gratifications may be sought within the marriage to balance satisfactions or frustrations which *each partner separately experiences outside the family*. This is not simply a function of external gratification, as Winch suggests, but the reverse is equally true. Imperfect complementarity between the spouses leaves residual frustrations which turn the couple outward, to others, for gratification.

The relation between internal and external need satisfaction is a two-way street which spouses may traverse in different directions. Since husband and wife typically have different ranges of role outlets, the inter-spousal complementarity may have different value in the psychic economy of the two individuals. The husband's external gratification (in occupational roles, and so on) may leave a moderate residue of unsatisfied needs to be complemented by his spouse. His wife, with typically more limited external opportunities, may be far more dependent on the marital complementarity itself to achieve a comparable overall satisfaction-frustration balance. Thus, in highly oversimplified terms, the husband may depend on the marriage to gratify a minor portion of his needs while the wife may depend on it to gratify a major portion of hers. Consequently, the husband may require a marital complementarity which (following Winch) only supplements his external gratifications; conversely, the wife may press for the external gratification of a substantial residue of needs which the marriage does not satisfy. As a result of imperfect complementarity, each may bring different kinds of needs into external associations. The *meaning*, then, of an observed complementarity pattern cannot be fully assessed apart from the spouses' separate external gratifications, and this factor should preferably be controlled in an assessment of the effects of need-fits on marital adjustment.

Clearly, there is no simple connection between complementary needs and marital equilibrium. A given pattern of need-fit may have different value in the four contexts of complementarity which have been considered.

Spouses may complement each other's needs beautifully in purely personal relations, but still be peculiarly ill-equipped to deal with the world around them, either separately or together. Similarly, they may complement one another well on a core of needs, but one partner might satisfy his remaining needs outside while the spouse does not. The larger pattern of marital equilibrium is a resultant of these separate sets of relational forces considered together. Accordingly, Winch's analysis of purely inter-personal need-fits can profitably be extended to the other contexts.

NEED PATTERNS

In working from Murray's system, Winch finally adapted fifteen needs and traits as his operational variables. Another set of categories might yield different complementary relations. Only further exploration of broad ranges of needs can identify those whose complementarity has the greatest bearing on marital adjustment.

Winch's treatment of discrete needs as separate variables contains one unresolved ambiguity. His earliest formulation suggests that some needs may be highly inter-related (27). Presumably, high need deference is not completely independent of high need abasement. As we might expect from theory and clinical experience, such attributes tend to be patterned, or to cluster, according to personality type. Yet, Winch subsequently indicates in a footnote (30) that some different needs, such as low need deference and high need recognition, might appear similar. One might, therefore, conclude that positive correlations between some different needs (viz., high recognition and high dominance) seem to express the same complementarity as a negative correlation on a single need (viz., high and low recognition). But Winch asserts that this is not the case, that the separate need ratings can vary independently of one another (30). So, on the assumption that one rating does not presume another, he treats the needs as true independent variables.

There is a real issue here in the partial tautology among discrete categories and in the resulting use of different indicators of essentially similar fits. While some needs are independent, others are highly associated as an artifact of the categories themselves. The crux of the problem appears when one set of extremes from two variables are almost synonymous while their respective opposite poles are unrelated to each other. For example, high need dominance and low need deference overlap. But what is the complement, or *opposite*, of high need deference—high dominance, high autonomy, high recognition, or some other need? High dominance and low deference represent a common point where two presumably different variables overlap so that they are no longer discrete. While some needs are exclusive categories, others are not.

Statistical techniques are one technical approach to the problem, since they may help to disentangle clusters or underlying factors and perhaps isolate common high-level determinates. Winch early used a cluster analysis to identify those variables which were empirically complementary (31). Aside from the use of factor analysis in his own research, he apparently also supervised some parallel experiments with several techniques on his own data (22). While this may be invaluable in shedding some light on the conceptual difficulty, there is no assurance that it represents a solution. Highly inter-correlated variables may be distinguished, but sorting out those which are similar does not identify those variables which complement each other as opposites. For example, in his early cluster analysis (31), Winch was able to classify the needs into a five-group assertiveness-receptivity continuum. The most assertive pole embraced the needs of autonomy, achievement, dominance, and hostility. At the opposite pole, the receptive extreme included abasement, deference, succorance, and vicariousness. This sorting is valuable, but furnishes no principle for discriminating those needs in the receptive pole which are complements, or opposites, of given needs in the assertive group.

The problems of complementary needs remain intrinsically conceptual. And conceptual clarity would seem to depend on a holistic view of personality, one which ideally types personality as an organized system, if only by synthesizing independent need ratings into need syndromes. This calls for a methodology of global personality types, preferably derived from independent psychological data, or, *in extremis*, from the need elements themselves. Needs or other variables can be used to construct personality types which may then enter the analysis at least as intervening variables between individual need items and complementarity patterns.

The necessity for such an organizing framework is indeed implicit in Winch's own research. Factor analysis yielded some preliminary typing of personality features, the isolated factors being informally designated almost as organizing needs of the personality, viz., "hostile dominance," "neurotic self-depreciation," etc. (16). This frankly empirical typology was adequate to test Winch's hypothesis. While empirical types are not necessarily devoid of theoretical significance, in this instance they could only clarify the meaning of the results to a limited degree, for the content of the needs is crucial for the theory. Ktsanes noted that, "Attempts to name them [the factors] were made almost solely out of curiosity to get an idea of the content of the personality dimensions with which we were working" (16). On the basis of this experience, future research may be better able to abstract statistically personality types which are more intimately related with clinical experience and theory.

Until there is greater conceptual clarity, certain statistical difficulties

will remain unsolved and subject only to arbitrary decision. For example, in one footnote, Winch observes:

10. It has been noted that type I complementariness always involves a negative interspousal correlation. It so happened that all of our type II hypotheses involved predictions of positive correlations, but there is nothing in the nature of the formulation to determine that they will necessarily be positive (28).

Quite so, but this may reflect not so much a decision about which end of a continuum will be designated as high or low so much as a problem about the content of the variables themselves and the psychological nature of their relatedness.

A more incisive difficulty appears elsewhere. Winch set up an interspousal correlation matrix in which the fifteen needs and traits of each spouse were correlated with those of the other. Some of the fifteen variables were further dichotomized and double-dichotomized for overtness and/or direction of expression. This yielded forty-four sub-variables or sub-matrices. An effort was then made to predict the direction of interspousal correlation for each sub-need, on the basis of Freudian psychology, the theory of complementary needs, and common sense. But the limited theoretical ground restricted the predictions which could be made for the individual needs (28, 31). Winch found that, "We had developed the theory of complementary needs only to a point from which we were able to deduce that the interspousal correlation of husbands' scores with wives' scores on the same variable should be negative" (28). But, with reference to predicted correlations between *different* variables, he points out in a footnote:

7. These 44 predictions (or sub-hypotheses) involved 15 sub-matrices which contained a total of 150 elements. At the time of formulating these sub-hypotheses we felt that we should like to predict the signs of all these 150 interspousal correlations, but that the outcome was not sufficiently assured to make it advisable to proceed with all of this labor. It is for this reason that we predicted only a little less than a third of the total number (28).

Such economic decisions are often inevitable and sometimes even advisable in pioneering studies. But it is vital for future research to locate the source of the difficulty. It seems that without reference to a person's larger personality structure, there are few firm principles by which to predict the complement of many of his needs. By overlooking the function of a need in the personality organization, we eliminate from consideration the significant psychological conditions in which the need occurs. This may be the root of the difficulty and the source of various prediction failures. For example, Winch found significant positive correlations between husband's need succorance and wife's need nurturance, but *not* the reverse, i. e., husband's nurturance and wife's succorance (30), while Ktsanes found that

"the principle of polar attraction operates systematically only in the case of some specific need patterns. This suggests that the complementary need hypothesis is a more complicated principle than the mere principle of 'opposites attract'" (16). Furthermore, we know that the stereotypical authoritarian personality tends to exert strong dominance and control over subordinates and is extremely submissive to superiors. Or dominance in one person may express the need to control, in another it might signify aggression, and in a third the strong need to nurture. Under these conditions, how can one meaningfully hypothesize the complement of a *raw* dominance rating for these people—especially if many of our imperfect need categories admit several alternative complements?

If one basically assumes that a person's needs can vary quite independently of one another, a flexible research design is required for this free variation to emerge. Raw needs will almost necessarily be inter-correlated atomistically as part of a "saturation" approach. Accordingly, one would correlate a subject's dominance needs with all other needs of his spouse and then examine the empirical relationships which appear. Conversely, if one assumes a patterning and inter-dependence of a person's needs, a more selective approach is possible. Constructed personality types offer clearer theoretical guides in specifying the complement of a need in any given case. Otherwise, without some idea of the need's function in a personality organization, the chance of correctly predicting the complement of a need rating is seriously reduced. We might inadvertently (and with no check) observe only that portion of a whole need system which happens to be tapped by the situation under examination.

Thus, it seems advisable to analyze need complementarity in a framework of global personality types which can, in effect, be held constant. Such personality types might be synthesized from the existing need categories (viz., Winch's groups on the assertive-receptive continuum (31)), but independent data would be preferable. They might be derived from existing psychological theory (viz., the various Freudian personality types), or they might be based upon other relevant notions of personality (viz., the Kleinian idea of mixed masculine-feminine components in everybody's personality). These are simply illustrative, and the most significant typologies or the personality dimensions on which they should be based will vary according to the problem in hand. While the abstraction of overall personality types is a complex operation, it is comparatively unimportant whether these adhere to any particular psychological persuasion or orthodoxy so long as they afford some dynamic picture of the gross personality organization. Even an eclectic battery of psychological premises is no disgrace so long as they produce a coherent, meaningful framework for the stabilization of the problem under study. Sociologists, after all, are not

responsible for resolving the complex technical controversies on the frontiers of psychological theory, and may freely make the best possible use of the available theoretical resources. Clearly, such a broader context can enrich the item-analysis of complementary needs. With some conception of the overall personality picture, we are better able to assess the *meaning* of observed need fits in the marriages of various personality types.

By *not* postulating a general need organization for individual subjects, immediate operational advantages of simplicity, economy, and precision may be realized. But these may prove to be short-run gains bought at the expense of severe analytic limitations. While personality typologies offer no *a priori* certitude of theoretical grace in the Protestant world of science, there may be no significant alternative in the evaluation of complementarity patterns.

CRITERIA OF COMPLEMENTARITY

The very heart of the problem lies in what constitutes complementarity, or how the complements of different needs are to be judged. At the moment, we are left with the simple formula that dissimilar or "opposite" needs are compatible, but with no clear basis for classifying individual needs as opposite.

For the time being, we can waive this problem in the face of an equally difficult one. When is one *pattern* of needs deemed to complement another? Since human nature consists of frail stuff, it would be surprising to find, even in the matches which are made in heaven, a perfect fit between the needs of spouses. Unfortunately, the need systems of any two people can only fit each other more or less imperfectly. Therefore, we require some criteria to judge the complementarity of larger need systems, or what Winch terms "the degree of 'meshing' of the personalities of the spouses" (30). Setting the analysis of individual needs in the context of larger personality types does not itself provide such criteria.

To judge the excellence of complementarity, we might devise some kind of "total score" to indicate the number of good fits in a series of individual need categories. This would give all the needs equal weight and equal value. Yet this begs the basic question because this is precisely how personality and need systems are *not* organized. Some needs are central and others peripheral, as Winch explicitly points out (27), and he appreciates the implication that fits between strong, major needs may hold a marriage together (17) regardless of the fits between minor ones. For example, a strong "human bondage" tie might solidify a couple in which one spouse has a syndrome (in Ktsanes' terms) of "hostile dominance" and the other of "neurotic self-depreciation," even though their peripheral needs might not be compatible. Thus, it is necessary to extract the organizing core of a

need syndrome through some principle of weighting and through a clarification of why certain needs have a high "valence" or "resonance" for one another, as in the prototype of a sado-masochistic relationship.

Further, not only are some needs more salient than others, but even among these, personality organization is beset with internally conflicting needs, as epitomized by the phenomenon of ambivalence. This is not a matter of basic needs which change through time, but of concurrent anti-thetic needs. These conflicting needs are most complex when they are both attached to a single object (pure ambivalence) and slightly less so when they refer to different objects. In the latter case, there is greater chance to segregate the expression of the needs and more scope for minimizing their conflict. The problem, then, is to determine which of these conflicting needs tends to prevail under given conditions. Winch illustrates the problem by a dominant, socially ambitious woman, and he asks whether she chooses a dependent spouse (to complement her dominance) or a dominant husband (to complement her status needs) (17). The theory implicit in personality typing may guide such predictions, but perhaps only partially. Because of differences in sheer need intensity, the identification of ascendant needs in given personality types may largely remain an empirical matter.

This highlights the need for criteria of complementarity in the imperfect need fits in a sample of couples. Some will fit well on a series of individual needs, but be hopelessly mismatched in their gross need patterns. Others will be extremely compatible in their overall personality systems, but show little complementarity on discrete categories. Still others will fit well or poorly all around. At this stage, there are few firm criteria for assessing the value of comprehensive fits, or even for evaluating the sensitivity of complementarity as an index of compatibility. Only further research can make inroads on the conceptual and operational criteria of complementarity.

FUNCTIONS OF COMPLEMENTARITY

The inference to be drawn from Winch's thesis is that dissimilar needs between the spouses are a basis of strength and equilibrium in a marriage. Opposites, so to speak, give each other mutual support and reinforcement, thereby facilitating adjustment, while similar needs may be a source of rivalry, conflict or strain or otherwise leave a residue of frustration. In the course of solving some of the other issues, light can be thrown on a corollary of this proposition.

While dissimilarities may be a source of strength, many *similarities* of need might be equally compatible and equally functional. For example, similar status aspiration needs might strengthen a marriage just as dissimilar ones may weaken it. Other things being equal, two compulsive people might experience less strain than a couple in which one spouse is

punctilious and the other lax. Or, on temperamental grounds, a gentle couple or a tempestuous pair may be fully as compatible as a couple with one placid and one volatile spouse. Other needs may operate in the same fashion, with similarities providing a source of reinforcement and strength.

The basic question is: which similarities and which dissimilarities have functional or dysfunctional consequences? Clearly, there are four possibilities here. While Winch focused his attention on one combination, the functional dissimilarities, the remaining patterns are equally relevant to the problem of marital equilibrium. Happily, however, the same bodies of data can be extended to these other possibilities.

CHANGING NEEDS THROUGH TIME

A person's various needs may change in relative importance, so that different ones become central through time. This refers neither to superficial mood instabilities nor to simultaneously conflicting needs, but to the changing organization of basic needs in response to growth, development and life experience. Thereby, different needs may come into prominence in different life stages. Winch notes this process (27). Nelson Foote offers a trenchant discussion of the problem and suggests that different developmental trends between spouses may produce serious marital strains and dislocation (11). Elsewhere, in contrast to a common assumption that people who divorce may often have strong neurotic trends which doom them to a succession of instable marriages, William Goode suggests that the proportion of successful marriages among the re-married should approximate that of first marriages (13). A "maturation" factor—or shifting personality needs through time—would doubtless figure in such an adjustment rate. By this token, cardinal needs in courtship might be expected to shift during early, middle, and late stages in marital history. Consequently, the need fits of many couples might be drastically altered in the course of the marriage.

Winch only attempts to examine need fits at one point in time. Even without special designs for longitudinal studies, his general approach can also be applied to long-term trends, with changing need fits analyzed from properly staged re-tests of a panel at selected intervals in the marital history. Clearly, re-testing only intensifies the importance of overall systems of need organization and the criteria for determining complementarity. Nonetheless, it would be of the utmost importance simply to describe and document the character of long-term need shifts, the ensuing changes in complementarity patterns, and their effects on marital integration.

There are at least four different areas of pressure in which the determinates of changing needs may be located. (a) There is the pressure of internal growth whereby an individual's latent needs, skills or capacities

gradually emerge over time as a result of sheer maturation. (b) There are interactional pressures which arise from the mutual impact of the spouses in the course of marital adjustment, from the pleasures and frustrations, the fun and disappointment, the problems and adaptations of a continuing intimate relationship. (c) There are pressures from significant new roles and group memberships, both familial (viz., parenthood) and non-familial (viz., new occupational and community statuses), with their changing associations. This is significant insofar as needs shift with changing aspirations, gratifications, expectations, and self-images which new statuses bring in their wake. (d) Finally, there are pressures from other major life experiences, such as sundry traumata, patterned successes and failures in achieving goals, or such wholesale re-organization of need fulfillment as may accompany psychotherapy. While these four classes of experience do not exhaust the causes of changing needs, they help to locate the life spheres where determinate pressures may originate.

The major question which follows concerns the extent to which changing needs are rooted in spouses' shared and non-shared experience, and the degree to which these arise from structural arrangements, from different role opportunities, and the like. Structurally-rooted non-shared experiences may stimulate divergent development, changing needs and new complementarity patterns. Some of these may have little effect on marital equilibrium while others may seriously undermine it.

The correlative problem is the nature of strengths in a given marriage which operate either: (a) to segregate the changing needs and confine them to non-familial roles, so that at least the purely personal interspousal complementarity is minimally affected; or (b) to counter-balance need changes so that the shift occurs in *pattern* rather than *cohesive strength* of complementarity, thereby replacing an old fit with a new one which is equally integrative; or (c) to resist the pressures to change personality needs at all, the complementarity itself yielding gratifications which are rich or strong enough to militate against the change pressures.

These responses to experience are particularly relevant to Foote's ideas, for they dramatize the value conflict in which personal development may be embroiled. When there are dissimilar developmental trends, the person may ultimately be confronted with a rather stark choice between personal growth and marital integration—with our fullest recognition that these are not necessarily mutually exclusive alternatives. This is no mean dilemma in contemporary achievement-oriented societies, for powerful forces are at work to implement both values. For example, sundry social service and psychotherapeutic programs are geared to reconcile these ends and to realize the best of both possible worlds. Less clear at the moment, however, are those patterns of personality fit in which personal growth and marital

integration work at cross purposes and those in which they may be realized simultaneously, either in the marriage itself or by segregating the marital and achievement values in different spheres. This is a rich area for future study of role conflict and family strain.

CONCLUSION

It should be abundantly clear that this review is not critical of Winch's work, especially insofar as it considers many issues which he explicitly recognized in his writing, but which he had no opportunity to elaborate. His work represents a valuable entree to an extremely complex and subtle problem area. Although many important questions could not be discussed here, we have reviewed some major spheres, such as marital integration, to which his work can be extended and have outlined some major issues which remain to be solved in the course of future studies.

At the same time, it should be noted that the fruits of these solutions are relevant not only to family studies, but to many other problem areas as well, notably personality types and the division of labor, cohesion in small groups, stable marginal adjustments (such as complementary neuroses), the recent interest in inter-personal competence (12), etc. Many of the methodological problems in these spheres are essentially the same as those in the theory of complementary needs.

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Multidimensional Ratings of Occupations¹

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A relatively large number of empirical studies have now been made of the popular evaluations of occupations. Although these researches have blocked out fairly well the main dimensions of the popular hierarchy of occupations, the reasons why certain occupations are regarded highly and others less well still remain somewhat obscure. The present article attempts to outline an approach to this problem through the use of multidimensional ratings of occupations.

Research into the popular evaluation of occupations, which has now been conducted in several countries (10), has proceeded according to a typical design in which respondents have been asked to rate or rank occupations only according to a *single* criterion which has been of a *general* or summary nature, such as "general standing," "general reputation," or "social standing." Consequently, we are unable to state how these occupations would be rated on more specific dimensions, nor is it at all clear why the particular occupations have been assigned the general standing accorded them. In two of the sociological studies (12, 17) respondents were asked to state the reasons for their evaluations. The reasons given were of such a heterogeneous character that one is led to assume that the respondents were not able easily to articulate the bases for their evaluations. Another more recent study (3) did present a number of ratings along several dimensions, but did not consider the interrelationships among the ratings. At least two psychological experiments (1, 13) have been conducted which elicited occupational ratings along a series of dimensions, but both were based on small samples of college students and were designed mainly to test the effects of a general "frame of reference" on the judgments made along particular dimensions rather than to discover the actual pattern of popular ratings.

It is fairly obvious that occupations vary with regard to a wide variety of characteristics such as their income, work conditions, command of respect

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or prestige, training requirements, and numerous other features. Furthermore, we know that although these specific features are not distributed at random, jobs do vary considerably in the profile or combination of characteristics which they display. One might well expect, therefore, that in the popular evaluation of occupations each job would be to some degree judged separately on several dimensions and that, in addition, the standing of the occupation on the specific traits would enter systematically into its general evaluation. Adequately to encompass the richness of empirical reality and to prove theoretically more interesting, studies of popular evaluations of occupations should simultaneously explore several dimensions, *specific and general*. We believe the study we are reporting to be the first to analyze occupational ratings along a series of sociologically important dimensions from a large and diversified sample drawn from a wide range of subgroups within the population of a large-scale industrial society.

The ratings we shall analyze are of Soviet occupations. Former Soviet citizens rated each of 13 Soviet occupations along 5 separate dimensions. The specific findings concerning the interrelationships among these ratings apply, of course, primarily to the Soviet occupational system and therefore contribute to our knowledge of that society. A major purpose in presenting this material, however, is to illustrate a new approach to the study of the popular evaluation of occupations, and to provide a base for future comparative or cross-national studies.

Multidimensional ratings afford a relatively complex analysis. In this article we can present only part of our findings, reserving additional material for a later presentation. We shall be concerned here with four major topics: (a) How do these occupations fare in the perceptions of former Soviet citizens, that is, what is the "profile" of ratings which each of the occupations presents? (b) How much consensus is there concerning each of the occupations and each of the dimensions? (c) How closely do the ratings correspond with "objective reality"? (d) What do each of the separate ratings contribute to the general evaluation of each occupation? A subsequent article will be concerned primarily with individual and subgroup differences in these ratings.

THE DATA AND SAMPLE

The occupational ratings we shall analyze were obtained as part of a larger investigation into the functioning of the Soviet social system. Paper and pencil questionnaires were administered in 1950-1951 to 2,146 former Soviet citizens who either were in displaced persons camps in Germany (1,505 cases) or had recently emigrated to the east coast of the United States (641 cases).

Each occupation was rated on a five-point scale for each of the five dimensions according to the following form:

1. Taking everything into consideration, how desirable was it to have the job of (*teacher*) in the Soviet Union? Very desirable? Desirable? So-so? Undesirable? Very undesirable?
2. How satisfactory was the material position of the (*teacher*)? Excellent? Good? Average? Poor? Very poor?
3. How high was the personal satisfaction of a (*teacher*) with his work? Very high? High? Average? Low? Very low?
4. In comparison with other kinds of jobs, how dangerous was the job of (*teacher*) from the point of view of being arrested? One of the safest? Safer than some? So-so? More dangerous than some? One of the most dangerous?
5. How did the population regard (*teachers*) in general? With great respect? With respect? With indifference? With contempt? With great contempt?

These same questions were repeated for each of thirteen occupations.

It is extremely difficult to judge to what extent the ratings obtained from this sample would differ from ratings obtained from a sample of the total Soviet population (assuming optimum interviewing conditions). The circumstances which led Soviet citizens into our sample were such as to introduce very obvious selective biases. It is worth while at this point to review briefly the nature of the total refugee population and certain salient characteristics of our sample, so that the reader may be apprised of these biasing factors.

At the close of World War II several million Soviet citizens found themselves outside the boundaries of their country mainly as a result either of having been taken as prisoners of war by the German Army (mainly 1941-1943), or as a result of having been impressed by the Germans as forced laborers (mostly from 1943-1945). Of this group, a large number, variously estimated to be between 250,000 and 400,000, elected to remain in the West as refugees rather than return to Soviet control (8).

Hence the total refugee population is biased in the direction of over-representation of former Soviet military personnel and citizens who were residing in the territory which was invaded by the German army. Furthermore, the decision not to return to Soviet control, although strongly influenced by the real and anticipated harshness of the regime's treatment of those who had been in a situation of potential collaboration with the Germans, must be assumed to reflect some degree of disaffection from the Soviet system. Finally, we may note that the total size and composition of the entire refugee population is not known, and it is therefore difficult even to estimate the extent to which our sample is representative of the parent body of refugees. Those who answered the questionnaires volunteered to do so, although they were paid for their time. At the least, therefore, they were self-selected to include mainly those who were literate—although some illiterates did volunteer and were assisted in completing the questionnaire—and may have been further self-selected to include a disproportionately large number of those hostile to the regime.

However, it must be recognized that many of the refugees were in that position largely as a result of the accidents of life history. More than a third of them asserted that they had once favored the Soviet regime, more than half gave the fear of political repression as their reason for not returning, and 80 per cent and more in all subgroups showed themselves in favor of the "welfare-state" features of the Soviet system. It should be noted, in addition, that the refugees are apparently not drawn predominantly from narrow deviant groups in the population, but rather they come from all age, educational, and occupational groups with extremely strong representation from the well-trained and occupationally successful.

While no case can be made that our sample is representative of the Soviet or even of the refugee population, it should be borne in mind that unrepresentativeness *per se* is not a fatal sample fault. While the experiences of our sample are such as to seriously affect the way in which they answer questions concerning their attitudes toward what they conceive to be ideological or political matters, the weight of the evidence is that such experiences did not seriously affect the way in which they reacted to most Soviet occupations or toward their own work experiences. As we have reported elsewhere (10), the ratings given by this sample were highly comparable to ratings given by a set of five other samples, all drawn from other industrialized nations. It is therefore our belief that the ratings presented here would not radically differ from ratings obtained from a sample of present Soviet citizens, assuming optimum interviewing circumstances.

The ratings given by our sample are presented in summary form in Table 1. Average ratings were computed on each dimension for each occupation, by assigning arbitrary weights of 0, 25, 50, 75, and 100 to each of the five response categories, in the questions described above excluding from consideration the "don't know" and "no answer" responses.²

CONSENSUS OVER RATINGS

The degree of consensus over ratings is of interest as an indication of the extent to which the perception of characteristics of occupations is relatively uniform despite the diversity of subgroups composing the sample. Furthermore, if it can be shown that variability is slight or modest, we may feel more confident in analyzing the results for the sample as a whole.

As a measure of the degree of consensus, the standard deviations for each of the ratings of each of the occupations have been computed and are presented in Table 2. Although there are no formal standards by which we can make an absolute judgment as to whether or not a given standard devia-

² On most occupations, the proportion of such responses was consistently between 5 and 10 per cent, but for *factory manager*, *brigade leader*, and *party secretary* the rate rose as high as 25 per cent on several of the dimensions.

TABLE 1

*Ratings of Soviet Occupations According to Their General Desirability, Material Position, Personal Satisfaction, Safety, and Popular Regard**

Occupation	Rating				
	General desirability	Material position	Personal satisfaction	Safety†	Popular regard
Doctor.....	75	59	59	57	76
Scientific worker.....	73	64	57	37	70
Engineer.....	73	62	54	26	68
Factory manager.....	65	84	61	22	48
Foreman.....	65	52	48	44	60
Accountant.....	62	53	48	45	54
Officer in armed forces.....	58	70	53	35	53
Teacher.....	55	42	41	46	66
Rank and file worker.....	48	23	28	65	63
Farm brigade leader.....	46	46	39	45	41
Party secretary.....	41	86	62	41	17
Collective farm chairman....	38	67	43	35	30
Rank and file collective farmer.....	18	8	9	57	57

* See text above for the wording of the questions which elicited these ratings, and for the scoring system. The occupations are listed in order of *general desirability*. In cases of tie score, the occupation with the highest proportion of "very desirable" ratings is listed first.

† A high score in this dimension indicates that an occupation was regarded as being relatively *safe* from the dangers of arrest.

tion represents consensus, it is possible to compare these with values which would be obtained in certain extreme situations. For example, if the respondents divided into two equal sized groups, one giving the highest possible rating and the other giving the lowest possible rating, the resultant standard deviation would be 50.0 in this situation of complete "ambivalence" in the sample. Or, if equal numbers of respondents voted for gave each of the five rating categories, the resultant standard deviation would be 35.4. This latter condition might be termed "complete lack of consensus." Since all *average* standard deviations shown in Table 2 are lower than either of these two extreme standards, we may conclude that our sample tends toward consensus in both the images of the occupations rated and in each rating dimension. Note, however, that some of the standard deviations for *Party secretary* are higher than 35.4, indicating some degree of bimodality in the ratings of this occupation. In some of our later computations we will omit consideration of this occupation.

In further support of our judgment that the sample tended toward consensus we note that there is little variability in ratings among age and occupational subgroups of the population. This will be reported fully in a sub-

TABLE 2
*Standard Deviations of Occupational Ratings**

Occupation	Rating Dimension					
	Material position	Popular regard	Personal satisfaction	Desirability	Safety	Average standard deviation†
Accountant.....	16.8	10.5	16.5	19.7	23.5	17.9
Foreman.....	17.5	17.8	17.9	20.7	22.2	19.3
Brigadier.....	17.8	19.4	19.5	22.8	21.1	20.2
Engineer.....	18.6	17.7	19.9	21.2	25.2	20.7
Doctor.....	20.8	18.3	22.1	21.6	25.0	21.7
Collective farmer.....	13.6	24.7	16.1	23.8	29.1	22.2
Teacher.....	19.4	19.8	22.8	25.5	24.1	22.5
Worker.....	17.5	19.7	20.3	28.1	26.4	22.8
Army officer.....	19.5	22.1	21.2	26.3	25.7	23.1
Scientist.....	22.0	20.8	24.6	23.0	27.8	23.8
Farm chairman.....	23.3	20.3	26.7	29.4	24.0	24.9
Factory manager.....	17.7	25.1	24.4	28.9	27.6	25.0
Party secretary.....	18.7	20.5	31.9	37.0	35.8	28.8
Average standard deviation†.....	18.8	20.0	22.2	25.6	26.2	

* Note that the occupations and the rating dimensions in this table are ordered in terms of increasing average standard deviations, either down each column or across from left to right along each row.

† Average standard deviations were computed as the square root of the sum of the average of variances in a row or column.

sequent article, but by looking ahead to Table 5 one can find one illustration of the consensus pattern in the extremely high agreement between the ratings of an occupation by its actual incumbents as compared to those of the population at large. Finally, we note that the variability among former Soviet citizens in rating the "general desirability" of jobs is very much on a level with the amount of variability among Americans ratings of comparable occupations on their "general standing" as reported by the National Opinion Research Center (12). The average standard deviation of American respondents for ten matched occupations was 20.0 compared with 24.7 for the former Soviet citizens.

As a measure of the over-all consensus on each dimension, the average standard deviation for each type of rating is presented in the last row of Table 2. Tests of significance (17, p. 190) were run on the differences between selected standard deviation in Table 2. With $N=2,146$, and some degree of correlation between scores given by individuals for dimensions and between occupations, very small differences are statistically significant. For example, the difference between 16.8 and 17.5 given $r = 0.0$ yields t

= 1.8, which is significant at the .05 level. Since the correlations between scores are on the average around .50, the differences between pairs of standard deviations in Table 2 are almost all highly significant. Reasoning further, we may be confident that the differences between the average standard deviations shown in the last row of this table are also significant.

No single, simple explanation apparently holds for this rank order in degree of consensus. The greatest degrees of consensus obtain over the occupations' perceived *material position* and *popular regard*, the least over *desirability* and *safety*, with *personal satisfaction* occupying an intermediate position.

Comparing consensus about occupations, we find that the "middle range" occupations such as *accountant*, *foreman*, and *brigadier* are the objects of the greatest agreement. It should be noted, however, that occupations receiving middle-rank ratings are less subject to the "ceiling effect" which is present in such short rating scales, and hence are more likely to have higher standard deviations by virtue of that fact alone, than are occupations which receive either very high or very low average ratings. The managerial occupations such as *collective farm chairman*, *factory manager*, and *Party secretary* generate most disagreement. The latter jobs must be defined as clearly controversial to this sample, since large numbers of respondents rated them in highly divergent ways. The status of *Communist Party secretary*, understandingly controversial, accounted for the largest standard deviation in the ratings on *personal satisfaction*, *desirability*, and *safety*. Indeed, inspection of the individual ratings indicates that the distributions were essentially bimodal.

Our data here seem to run counter to what Davies (5) has described as one of the most uniform findings in studies of occupational ratings; namely, that the greatest disagreement tends to be produced by the middle range occupations. The relative lack of agreement among our respondents with regard to the positions of high authority and responsibility may well be tapping what some writers have affirmed to be a national characteristic of Russians, namely their profound ambivalence about authority figures (9, 11, 14). It is also likely that many respondents reacted to the *Communist Party secretary* in particular, and also to *factory director* and *collective farm manager*, not merely as administrative officers but also as agents executing the resented policies of a tyrannical regime. Those in the sample who allowed themselves to be influenced by this aspect of these occupations would tend to give responses which were at another pole from those who gave more objective evaluations of these jobs.

OCCUPATIONAL RATING PROFILES

Can the individual dimensions be empirically distinguished one from the other? Or, is it the case that our respondents tend to have a rather global

TABLE 3
Rating Profiles for Selected Occupations

Occupation	Desirability	Material position	Personal satisfaction	Safety	Popular regard	Summary		
						+	0	-
Doctor.....	+	0	+	+	+	4	1	0
Scientist.....	+	0	+	0	+	3	2	0
Engineer.....	+	0	0	-	+	2	2	1
Factory manager.....	+	+	+	-	-	3	0	2
Foreman.....	0	0	0	0	0	0	5	0
Accountant.....	0	0	0	0	0	0	5	0
Army officer.....	0	+	0	-	0	1	3	1
Teacher.....	0	-	-	+	+	2	1	2
Worker.....	0	-	-	+	0	1	2	2
Brigade leader.....	-	-	-	0	-	0	1	4
Party secretary.....	-	+	+	0	-	2	1	2
Farm chairman.....	-	+	0	-	-	1	1	3
Collective farmer.....	-	-	-	+	0	1	1	3

Note: A + indicates that an occupation ranks among the top four; a 0 indicates ranking among the middle five; and a - indicates ranking among the lowest four. The occupations are listed in order of average desirability, following Table 1.

image of any occupation and that ratings along any dimension are assimilated to this over-all assessment?² In Table 3 we have summarized in "profile" form the ratings received by the 13 occupations. Each occupation is given a +, 0, or - for each of the ratings it has received according, respectively, to whether it has achieved a rating among the four highest, the middle five, or the four lowest occupations. The jobs have been arranged from top to bottom in the order of their *desirability* rating.

Although there is some "strain toward consistency" in the rating pattern, it by no means is the case that occupations are similarly rated regardless of the dimension. Knowledge of an occupation's standing on only one dimension would hardly permit the prediction of its standing on all the other dimensions with a high degree of accuracy. Only two occupations—*foreman* and *accountant*—have the same standing on all five dimensions, and in both cases their ratings are not at the extremes but in the middle range. At the extremes, there are two other occupations which come close to a consistent rating, the *doctor* at the positive pole having four + and one 0 scores, and the *brigade leader on the collective farm* at the negative pole having four - and one 0. On the whole, however, the individual occupations have quite

² There is undoubtedly more opportunity for such a "halo effect" to manifest itself in our data than in some more rigorous study design. The respondent rated an occupation along each dimension in a block of contiguous questions. A more rigorous design would separate the ratings in such a way as to minimize such spurious tendencies to consistency as might arise in this design.

diverse and often distinctive profiles, and we may therefore regard the individual dimensions as sufficiently independent measures to justify further exploration as to the factors underlying them.

Our conclusions conflict with those of both Asch, Block, and Hertzman (1), and Osgood and Stagner (13), who find that there is a "frame of reference" or "general standard" which leads individuals to assign similar standing to any given occupation regardless of the dimension rated. We believe the results they obtained to have been largely an artifact of their research design, and that their results are more an *illustration* of the operation of the "halo effect" than a proof that occupations will be similarly rated on all dimensions regardless of the dimensions being scored. For example, four of Asch's dimensions are attributes of the person—such as *intelligence* and *idealism*—rather than characteristics of the job, and the results may indeed therefore be assumed to be merely alternate expressions or reliability measures of the same dimension rather than a demonstration of a true "halo effect" spreading out to color discrete and distinctive dimensions.

Although particular occupations do not have a consistent standing on all dimensions, there is some evidence that certain types of occupation may as a group share a common, or at least a very similar, profile. The occupations chosen for inclusion in the list were in part selected to permit such comparisons.

Among the instances of similarity we may note that the three professions share rather positive profiles; they have identical high ratings on *desirability*, *material position*, and *popular regard*, and differ basically only in their *safety* ratings. This strongly suggests that the popular image of the professions, although not absolutely uniform, is one which treats those positions as having rather common life chances of a fairly positive sort. Similar findings have been shown for American occupations (12). Further, if we consider the two positions which have in common being at the bottom of their respective hierarchies, namely the *rank and file worker* and *collective farmer*, we again find very similar profiles. This time, the ratings are fairly consistently low, but there is agreement on four dimensions, and only one step separates the worker and peasant on the *desirability* scores. The one case of perfectly matched profiles, involving the *foreman* and the *accountant*, might at first glance seem not too relevant to the proposition that occupations holding comparable places in the occupational structure tend to share common evaluational profiles, since the one is manual and the other a white-collar job. In fact, however, the *foreman* and the *accountant* represent the point at which the manual and the nonmanual occupational realms greatly overlap. Just as the foreman stands first among workers, so the accountant stands first among the nonprofessional white-collar workers. Just as the foreman earns a wage well above that of the semiskilled worker, so the

accountant earns much more than the routine clerical employee. Both are regarded, and generally treated, by management as being close to it and in a sense directly serving it.

The profile comparisons also suggest that occupations on the same level but in different hierarchies will not necessarily be evaluated in the same way. For example, the profiles for the matched pairs—*factory manager-farm chairman*, *foreman-brigadier*, and *worker-peasant*—suggest that any position in the agricultural segment of the soviet economy will be evaluated as inferior to the comparable position in the industrial sector.

Determinants of Occupational Ratings

We have seen how these ratings are characterized by a substantial degree of consensus and that they combine to give occupations distinctive and meaningful profiles. What accounts for these popular conceptions? Do they represent primarily "projections" of images of occupations which have arisen in some fashion unconnected with their "real" attributes, or are they more or less faithful reflections of the "objective" characteristics of the occupations in question?

The one dimension which lends itself most easily to an analysis of this question is that dealing with *material position*. The concept of *material position*, of course, is somewhat broader than income alone, yet there should be at least a moderately good fit between the income received by an occupation and the score it received on the *material position* dimension. Table 4 presents the salary ranges received by seven of the occupations, along with the average ratings which they have received on the *material position* dimension. Soviet income statistics are unfortunately far from being broad in coverage or rich in detail, and the data given must be approached with caution. For example, the figures given are base rates and do not include the frequently very large supplementary earnings. In addition, the data are not all for the same year, and therefore do not hold constant the influence of the inflationary spiral. Finally, the upper limits given are somewhat arbitrary and, indeed, the real upper limits are exceedingly indefinite. Thus, the upper limit given for scientific workers is based on the pay of a senior professor, but one who was a member of the Academy of Sciences would earn several times that amount. Unfortunately, reliable data for the occupations at either extreme of the *material position* ratings (*Party secretary*, *factory manager*, and *collective farmer*) are also not available to us. Everything we know about their positions in Soviet society, however, gives us no reason to challenge the factual adequacy of the *material position* ratings which these occupations have received.

For those occupations for which income statistics were available, the material position ratings appear to fall very much in line with the actual income received by each occupation. There is also a tendency for the spac-

ing of occupations along the *material position* continuum to correspond to the spacing along the income distribution. Hence, we may conclude from Table 4 that the ratings of the material position of the incumbents of various occupations are by no means "mere projections" of popular images but rather that they closely reflect objective reality as measured by the incomes received by the rated occupations.

For three of the five dimensions on which we asked our respondents to rate the occupations, there can be no "objective" measure of the accuracy of the rating other than the "subjective" reaction of the incumbents of the position or of the population doing the rating. A special search of our questionnaires to locate individuals who were in the occupations rated yielded sufficient numbers of respondents who had worked in the jobs studied to make comparisons possible between incumbents and other respondents for 8 of the 13 occupations, as in Table 5.

In most cases the ratings of incumbents and nonincumbents are within a few points of each other. In only 5 of the 40 matches is there substantial disagreement (10 or more score points) and these reveal no particular pattern. The correlations between incumbents and others, as shown in the

TABLE 4
Ratings on Material Position and Income Ranges for Selected Soviet Occupations

Occupation	Average DP rating	Salary range
Army officer	70	7,500-24,000*
Scientist	64	7,200-15,600 ^b
Engineer	62	7,200-18,000*
Doctor	59	6,000-16,800 ^d
Foreman	52	9,000-13,000*
Teacher	42	4,800-5,700 ^f
Ordinary worker	23	2,800-5,800*

* Salaries are for 1939 and range from platoon to corps commander (15, p. 285).

^b Salaries are for 1937 and range from instructor or "junior scientist" to professor or "senior scientist" (14).

* The salaries are for 1939. They apply only to iron and steel industries and to regular engineers. Chief engineers presumably were put on a separate higher schedule (2, p. 93).

^d The rates apply to the year 1942 and range from "ordinary" doctor to "senior" doctor (17, 1944, p. 35).

* The rates are for 1940 but apply only to those working under the People's Commissariat for Heavy Industry. Rates in other major industries were comparable, but often the maximum base salary was less (17, 1940, p. 361).

^f The year is 1943 but rates apply only to secondary-school teachers in nonadministrative posts. Primary-school teachers earned less and school administrators were on a higher scale (4, pp. 180-3).

* The year was 1941, and the rates represent the range for all workers except auxiliary workers in all industries of the national economy (19).

TABLE 5

Comparison of Occupational Ratings by Incumbents vs. General Population

Occupation	Rating Dimensions										Sum of differences	No. of I
	Desirability		Material conditions		Satisfaction		Safety		Popular regard			
	I*	O†	I	O	I	O	I	O	I	O		
Doctor.....	75	75	36	59	56	59	63	56	79	76	-16	(26)
Scientist.....	76	73	54	64	60	57	41	37	66	70	-4	(48)
Engineer.....	73	73	54	62	53	54	19	26	69	68	-15	(70)
Accountant.....	65	61	48	53	44	48	45	44	58	54	0	(83)
Officer.....	70	58	67	70	51	53	38	35	61	53	+23	(30)
Teacher.....	60	54	39	41	40	41	45	46	70	66	+6	(106)
Worker.....	49	48	20	24	26	30	56	67	64	62	-16	(371)
Peasant.....	23	17	9	7	13	9	48	59	59	57	+3	(214)
Sum of differences (incumbent minus others).....	+32		-53		-3		-15		+20			
Correlation.....	.98		.95		.98		.87		.91			

Note: Ratings in this table represent average scores given by persons who held each occupation while in the Soviet Union and average scores given by all other persons who held each occupation while in the Soviet Union and average scores given by all other persons. The N for "others" may be gotten by subtracting the number of incumbents from the total sample size, 2,146. Scores for both incumbents and others are computed with DK and NA responses excluded.

* Represents incumbents.

† Represents others.

last row of Table 5, are substantial, ranging by dimension from .87 to .98, averaging .94. Thus we can say that the ratings assigned to jobs by incumbents and by the population at large are extremely, indeed, one might say extraordinarily, close.

In the next to last row of Table 5 are presented the sums of differences between the scores given by incumbents and the scores given by other individuals in the sample, a positive sum indicating that incumbents tend to give higher scores and a negative sum indicating the opposite. It can be seen that incumbents give a somewhat more sympathetic evaluation of their occupations, viewing them as slightly more *desirable*, higher in *popular regard*, more subject to arrest, and not so *remunerative*. No consistent pattern, however, appears for the *personal satisfaction* dimension. The fact that the direction of the differences is so consistent does not, however, detract from the outstanding similarity in the ratings given by incumbents of occupations as compared with those of the general population.

How can we account for this very close correspondence? We must point out, to begin with, that all the jobs we have studied may be regarded as

widely known, in at least a stereotypical sense, to the population at large, being extensively treated in the mass media. In addition, it is likely that in the course of daily life one would frequently come into personal contact with representatives of most. This is especially true for the manual positions which form so large a proportion of the total population, but it is also true for the two personal service professions, *teacher* and *doctor*, as well as the *army officer*. Furthermore incumbents may take into account the popular views of their occupation in coming to their own opinions about their job. Finally, evaluations are always made in terms of some frame of reference. The cultural values upon which these ratings of occupations are based are shared by both incumbents and the general population, and on these grounds alone some convergence between the two is to be expected.

A Regression Analysis of Desirability

The multidimensional ratings also may be analyzed through a correlation approach. In Table 6, we present the product-moment correlations among the five ratings.⁴ The coefficients show a rather large range, running from +.92 at one extreme to -.82 at the other. Furthermore, if we disregard signs, these correlations must be judged to be very large on the whole. Obviously we cannot pretend to have an adequate sample of occupations from the total occupations present in the Soviet labor force. The relationships shown here hold primarily for the occupations studied, while the total set of Soviet occupations may show patterns which diverge considerably from those shown in Table 5. Nevertheless, it is useful to proceed with the analysis if only to present a prototype of a form of analysis which may be applied to the further study of occupational ratings with more adequate data.

To some extent the high relationships among the variables shown in Table 6 may be attributed to the "halo effect" inherent in our study design. Yet, this cannot be the entire answer, because the "halo effect" presumably would operate to produce high positive relationships among all the variables, and we may see in Table 6 that this is not the case. For example, a comparison of the second and third rows shows that the two variables which are most highly correlated, *material position* and *personal satisfaction*, have quite different patterns of relationships to the other dimensions.

It is apparent that *material position* and *personal satisfaction* are highly

⁴ In order to present as clear a picture as possible of these interrelations, it was decided to omit *party secretary* from this analysis. As we have seen in Table 2, the degree of variability among the respondents concerning this occupation was so great that we felt that the average ratings did not adequately reflect opinions concerning it so much as the felt demands of the interviewing situation.

TABLE 6
Inter-Correlations among Ratings*

	Desirability	Material position	Personal satisfaction	Safety	Popular regard
	(1)	(2)	(3)	(4)	(5)
Desirability (1)		+.670	+.898	-.401	+.525
Material position (2)			+.920	-.818	-.180
Personal satisfaction (3)				-.644	+.167
Safety (4)					+.301
Popular regard (5)					

* It should be noted that the N for the correlation coefficients in this table is 12. With 11 d.f., a correlation must reach .497 or higher in order to be significantly different from zero at the .05 level. Under this criterion, six of the ten coefficients are significant.

associated, as are *personal satisfaction* and *desirability*.⁵ In other words, jobs judged high in personal satisfaction are on the average also rated high on *material position* and *desirability*, and any one rating can be fairly well predicted from its partner in each pair. Perhaps these findings would not draw any special notice, since in an industrial society we would expect the population to assume that highly paid jobs are satisfying, and to look on those which it judged to be satisfying as thereby desirable. The high association, this time negative, between the *safety* rating and the *material position* rating also seems unexceptional for Soviet conditions, since it in effect asserts that jobs which pay well, generally being responsible jobs, are also likely to be unsafe, whereas jobs which are not so well paid, generally carrying less responsibility, are nevertheless much safer. This pattern of association is in accord with reality.

It is not readily apparent, however, why *safety* and *personal satisfaction* should have so relatively high a negative association (-.644), indicating that the more satisfying jobs are judged to be relatively less safe. One

⁵ It should be borne in mind that these relationships obtain only for *average ratings*. Strictly speaking, our finding is that if an occupation receives a high average rating in *desirability* it will also receive a high average rating in *personal satisfaction*. This does not mean, however, that for *individuals* the more highly desirable an occupation is seen, the more personal satisfaction is imputed to the incumbents of that occupation. The correlations among individual ratings, which will be treated in another article, may present a considerable different pattern of relationships. In a sense, the analysis presented here is one of the relationships among norms, conceived of as central tendencies in a population. An analysis on the level of individual ratings is an analysis of variation around central tendencies, and such variation may be regarded as to some degree independent of the relationships that obtain among central tendencies.

might have assumed that in a society saturated with fear of political arrest, the safer a job was judged to be the more it would be regarded as satisfying. In good part, of course, the explanation lies in the fact that *personal satisfaction* and *material position* are highly associated, and as we have seen, jobs rated high on material rewards tend to be regarded as rather unsafe.

This should serve to bring to the center of our attention the fact that the correlations we have been considering are, of course, zero-order coefficients. In order to assess the weights which must be assigned to each rating when the other ratings are taken into account at the same time, we need to pursue a partial correlation analysis. We have chosen to approach this through the computation of a regression equation which expresses the *desirability* ratings as a linear function of the remaining four dimensions.

Although, strictly speaking, we might have chosen any other variable as the "dependent" one, we felt that this role was most properly played by the variable which represented a summary judgment. The *desirability* dimension was the only one in which the question put to the respondents stressed "taking everything into consideration." The *material position* and *safety* dimensions seem to be primarily reports reflecting "objective reality," and hence it made little sense to ask what other qualities of the job determined its *safety* or *material position* rating. Furthermore, as we have shown elsewhere (10), the *desirability* ratings were most similar to the summary general ratings for comparable occupations in five other countries.

Taken together, the four other variables related to *desirability* yield a multiple correlation coefficient of .99.* In other words, about 98 per cent of the variation in the *desirability* rating of a job can be accounted for in terms of its rating on *material position*, *personal satisfaction*, *safety*, and *popular regard*. Our problem, then, is to discover how these ratings interact simultaneously to produce an occupation's *desirability* rating, in particular to discover the extent to which each characteristic contributes to the over-all *desirability* rating. In order to accomplish this task, we have computed the following regression equation:

$$X_1 = -.89X_2 + 2.02X_3 - .24X_4 + .10X_5 + 16.8$$

Since the variances of each dimension are roughly equal, the absolute size of a coefficient may be taken as an index of the extent to which a

* It should be noted, however, that there are few degrees of freedom left when a five-variable multiple correlation coefficient is computed with but twelve observations. We are undoubtedly capitalizing on the idiosyncracies of the occupations studied here, and it is quite likely that a larger group of occupations selected from many different points in the Soviet occupational structure might yield a somewhat divergent pattern of interrelationships. To test this possibility, the regression equation was computed omitting *factory manager*, since this occupation was probably the most ambivalently regarded. No significant difference was found in the resulting regression equation or correlation coefficient.

variable contributes independently to the over-all desirability rating.⁷ Thus, we may conclude for the given array of occupations as rated by this particular sample that the *desirability* of an occupation will be highly associated with its *personal satisfaction*, with jobs high on the latter being also high on the former. In addition, a moderate association with the rating will also be shown by the *material position* of the job, tending to go in the opposite direction. Occupations rated high on *personal satisfaction* but not too high on *material rewards* would be judged most desirable. The ratings (Table 1) for *doctor*, *engineer*, and *scientific worker* all illustrate the operation of this effect. In contrast, the *factory manager* shows the negative effects of standing too high in *material position*. He has the highest *personal satisfaction* rating,⁸ but he also has an extremely high *material rewards* rating and is consequently found lower on the *desirability* scale than the others whom he otherwise outranks in *satisfaction*. To a lesser degree, the *officer in the armed forces* and the *collective farm chairman* also illustrate this effect.

The high association with *personal satisfaction* and the negative relationship of material rewards to the rating of *desirability* requires some comment. In the absence of comparable data from other social systems, we cannot determine whether the observed pattern is one peculiar to the USSR, or common to certain types of societies, for example, industrial societies, or, alternately, whether our respondents were expressing something peculiar to their status as refugees. There is some reason to believe that this pattern is somewhat related to the peculiar features of the Soviet regime. Occupations in the USSR receiving heavy material rewards tend also to be positions of considerable power and responsibility. Such positions are, at the same time, politically more vulnerable and, in addition, their incumbents are often the executors of the coercive measures of the regime. Under these circumstances, such occupations might come to be regarded with some ambivalence, valued because of their yield in *personal satisfaction* and *material rewards*, but regarded as "risks" in other respects and hence considered not as desirable, all told, as occupations which have a smaller yield. An "inner emigration" may develop, as we know it has to some extent, which leads people to deny mobility and monetary success values in favor of a prime emphasis on the intrinsic satisfaction of occupational pursuits.

We should not rule out, however, the possibility that the reported emphasis on *personal satisfaction* is a characteristic of industrial societies in general. Research in industrial sociology and the sociology of the professions has repeatedly called attention to the error of assuming that behavior

⁷ The statistical significance of the *b* coefficients is as follows: *b*₁ significant at the .025 level; *b*₂ significant at the .005 level; *b*₃ significant at the .10 level; *b*₄ significant at the .80 level.

⁸ Exclusive of the *Party secretary*, whose ratings, it will be recalled, were not included in the relevant computations.

in the occupational area can be understood solely in economic terms. There is reason to assume, furthermore, that as mass industrial society becomes more stabilized and the flow of goods reaches very high levels for all, the noneconomic aspects of the work situation become all the more influential in affecting the evaluation of jobs. In its turn, the negative weight of very high material rewards may be a characteristic of populations from societies whose values give heavy emphasis to welfare functions and are somewhat hostile to the rich. It may well be, therefore, that neither our sample, nor the Soviet population if one were to project to it, is particularly deviant in giving greatest weight to personal satisfaction on the job as a determinant of its *desirability*, nor even in being suspicious of high earnings. On the contrary, these may be a widespread characteristic of populations in industrial societies. Fortunately, this is subject to empirical testing, and it is to be hoped that the problem will be studied in the United States and elsewhere.

SUMMARY AND CONCLUSION

As a departure from the usual method of rating occupations along a single general dimension, 13 occupations were rated along 5 dimensions by a sample of former Soviet citizens. The earlier observed pattern for subgroups of the population to agree on the general standing they assign particular occupations was also present in these multidimensional ratings, as reflected here in high agreement between the scores assigned an occupation by its incumbents as against the rest of the sample. Occupations having similar places in the occupational structure, such as the professions, tend to have similar, although not identical, rating profiles. At the same time, the particular organizational hierarchy within which an occupation is located may result in its being given less favorable ratings than positions on a comparable level in a different hierarchy, as reflected in our data in the consistently lower ratings assigned the agricultural as against the industrial occupations. The occupations were not rated consistently high or low on all dimensions but rather showed relatively diversified rating profiles. This strongly suggests that occupations are realistically perceived in accordance with the objective differentiation in their "life chances" rather than in accordance with some general underlying standard which is then projected onto the other dimensions. This is further indicated by the fact that the ratings on *material rewards* and *safety* are highly congruent with the observed incomes and political arrest rates for the occupations rated.

The availability of ratings along a series of dimensions permits an exploration of the determinants of the more general or summary judgment of the standing of occupations as expressed in ratings on such dimensions as "*general desirability*." For the set of occupations judged by this sample, it appears that the *personal satisfaction* which inheres in the job is the prime

determinant of its rated *desirability*. The material rewards of the job also play a significant role, but, surprisingly, its effect is negative. It is not clear whether this result is peculiar to this sample or whether similar results would be yielded by samples from other industrial societies. In general, however, this study suggests that a precisely differentiated image of various occupations is widely diffused throughout modern industrial populations, and this must be recognized as important in understanding the integration of the larger social structure of such societies.

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